DOCUMENT RESUME

ED 183 960	CE 024 827
TITLE	Military Curricula for Vocational & Technical Education. Dental Specialist, 10-1.
INSTITUTION	Air Univ., Gunter AFS, Ala. Extension Course Inst.; Ohio State Univ., Columbus. National Center for Research in Vocational Education.
SPONS AGENCY	Bureau of Occupational and Adult Education (DHEW/OE), Washington, D.C.
PUB DATE	[74]
NOTE	434p.; Not available in paper copy due to small, light type.
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	*Allied Health Occupations Education; Behavioral Objectives; *Dental Assistants; *Dentistry; High Schools; Postsecondary Education; *Vocational Education
IDENTIFIERS	Dental Equipment; Dental Therapy Assistants; Military Curriculum Project

ABSTRACT

Designed to provide entry level apprentice skills to persons who wish to become skilled, specialist level workers as dental assistants, these course materials supplement laboratory or on-the-job learning situations. One of a number of military-developed curriculum packages selected for adaptation to civilian vocational curriculum and instruction, the course contains a considerable amount of review material and is stated to be suitable for beginning students with background in the basic sciences. Each chapter in the four-volume set is organized around learning objectives, accompanied by text with criterion exercises and answers keyed to the text for self-evaluation. Each volume also has a review examination containing questions keyed to the objectives; no answers are provided. Volume I, Administration, Safety, and Maintenance, discusses the professional-client relationship and general safety practices. Volume 2, Basic Dental Sciences, covers oral anatomy, physiology, and pathology; dental therapeutics; and basic microbiology and sterilization. Volume 3, Dental Instruments and Materials, describes the uses of general, restorative, and specialty instruments; and dental materials. It is accompanied by supplementary foldout charts. Volume 4, Clinical Procedures, describes preventative dentistry programs, dental radiology, general assisting procedures, and specialties. (MEK)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED183960

Drafting
Dietetics Dietetic
Diesel Repair Diesel
Dental Assisting
Data Processing
Curriculum Development
Construction Trades
Carpentry Carpentry
Blueprint Reading
Aviation Mechanics
Auto Mechanics
Welding Welding
Stenography Stenography
Small Equipment Repair
Radiology Radiology
Radio-TV Broadcasting
Printing Printing
Physical Therapy Assisting
Photography Photography
Nursing Nursing
Patternmaking
Medical Lab Assisting
Machine Shop
Management & Supervision
Air Conditioning
Food Service
Electronics
Electricity

Military Curricula for Vocational & Technical Education

DENTAL SPECIALIST

10-1

CE 024 827

THE NATIONAL CENTER
FOR RESEARCH IN VOCATIONAL EDUCATION
THE OHIO STATE UNIVERSITY

This military technical training course has been selected and adapted by The Center for Vocational Education for "Trial Implementation of a Model System to Provide Military Curriculum Materials for Use in Vocational and Technical Education," a project sponsored by the Bureau of Occupational and Adult Education, U.S. Department of Health, Education, and Welfare.

MILITARY CURRICULUM MATERIALS

The military-developed curriculum materials in this course package were selected by the National Center for Research in Vocational Education Military Curriculum Project for dissemination to the six regional Curriculum Coordination Centers and other instructional materials agencies. The purpose of disseminating these courses was to make curriculum materials developed by the military more accessible to vocational educators in the civilian setting.

The course materials were acquired, evaluated by project staff and practitioners in the field, and prepared for dissemination. Materials which were specific to the military were deleted, copyrighted materials were either omitted or approval for their use was obtained. These course packages contain curriculum resource materials which can be adapted to support vocational instruction and curriculum development.

The National Center Mission Statement

The National Center for Research in Vocational Education's mission is to increase the ability of diverse agencies, institutions, and organizations to solve educational problems relating to individual career planning, preparation, and progression. The National Center fulfills its mission by:

- Generating knowledge through research
- Developing educational programs and products
- Evaluating individual program needs and outcomes
- Installing educational programs and products
- Operating information systems and services
- Conducting leadership development and training programs

FOR FURTHER INFORMATION ABOUT
Military Curriculum Materials
WRITE OR CALL
Program Information Office
The National Center for Research in Vocational Education
The Ohio State University
1960 Kenny Road, Columbus, Ohio 43210
Telephone: 614/486-3655 or Toll Free 800/848-4815 within the continental U.S. (except Ohio)

THE NATIONAL CENTER
FOR RESEARCH IN VOCATIONAL EDUCATION
The Ohio State University · 1960 Kenny Road · Columbus, Ohio 43210
Tel (614) 486-3655 Cable CTVOCEDOSU/Columbus, Ohio

Military Curriculum Materials for Vocational and Technical Education

Information and Field Services Division

The National Center for Research in Vocational Education

Military Curriculum Materials Dissemination Is . . .

an activity to increase the accessibility of military-developed curriculum materials to vocational and technical educators.

This project, funded by the U.S. Office of Education, includes the identification and acquisition of curriculum materials in print form from the Coast Guard, Air Force, Army, Marine Corps and Navy.

Access to military curriculum materials is provided through a "Joint Memorandum of Understanding" between the U.S. Office of Education and the Department of Defense.

The acquired materials are reviewed by staff and subject matter specialists, and courses deemed applicable to vocational and technical education are selected for dissemination.

The National Center for Research in Vocational Education is the U.S. Office of Education's designated representative to acquire the materials and conduct the project activities.

Project Staff:

Wesley E. Budke, Ph.D., Director
National Center Clearinghouse

Shirley A. Chase, Ph.D.
Project Director

What Materials Are Available?

One hundred twenty courses on microfiche (thirteen in paper form) and descriptions of each have been provided to the vocational Curriculum Coordination Centers and other instructional materials agencies for dissemination.

Course materials include programmed instruction, curriculum outlines, instructor guides, student workbooks and technical manuals.

The 120 courses represent the following sixteen vocational subject areas:

- Agriculture
- Aviation
- Building & Construction Trades
- Clerical Occupations
- Communications
- Drafting
- Electronics
- Engine Mechanics
- Food Service
- Health
- Heating & Air Conditioning
- Machine Shop
- Management & Supervision
- Meteorology & Navigation
- Photography
- Public Service

The number of courses and the subject areas represented will expand as additional materials with application to vocational and technical education are identified and selected for dissemination.

How Can These Materials Be Obtained?

Contact the Curriculum Coordination Center in your region for information on obtaining materials (e.g., availability and cost). They will respond to your request directly or refer you to an instructional materials agency closer to you.

CURRICULUM COORDINATION CENTERS

EAST CENTRAL
Rebecca S. Douglass
Director
100 North First Street
Springfield, IL 62777
217/782-0759

MIDWEST
Robert Patton
Director
1515 West Sixth Ave.
Stillwater, OK 74704
405/377-2000

NORTHEAST
Joseph F. Kelly, Ph.D.
Director
225 West State Street
Trenton, NJ 08625
609/292-6562

NORTHWEST
William Daniels
Director
Building 17
Airdustrial Park
Olympia, WA 98504
206/753-0879

SOUTHEAST
James F. Shill, Ph.D.
Director
Mississippi State University
Drawer DX
Mississippi State, MS 39762
601/325-2510

WESTERN
Lawrence F. H. Zane, Ph.D.
Director
1776 University Ave.
Honolulu, HI 96822
808/948-7834

DENTAL SPECIALIST

Table of Contents

Course Description Page 1

Volume 1

- Administration, Safety, and Maintenance - Text Material Page 3
- Volume Review Exercise Page 51

Volume 2

- Basic Dental Sciences - Text Material Page 60
- Volume Review Exercise Page 158

Volume 3

- Dental Instruments and Materials - Text Materials Page 172
- Volume Review Exercise Page 235
- Supplementary Material - Diagrams Page 247

Volume 4

- Clinical Procedures - Text Materials Page 294
- Volume Review Exercise Page 428

DENTAL SPECIALIST

Correspondence Course **10-1**

Developed by:

United States Air Force

Development and Review Dates

Unknown

Occupational Area:

Health

Cost:	**Print Pages:**
$9.00	444

Availability:
Military Curriculum Project, The Center for Vocational Education, 1960 Kenny Rd., Columbus, OH 43210

Suggested Background:

Chemistry, biology

Target Audiences:

Grades 10-adult

Organization of Materials:

Criterion objectives, text, criterion exercises, answers, supplementary charts, volume review exercises

Type of Instruction:

Individualized, self-paced

Type of Materials:			**No. of Pages:**	**Average Completion Time:**
Volume 1	–	*Administration, Safety, and Maintenance*	43	Flexible
		Volume Review Exercises	15	
Volume 2	–	*Basic Dental Sciences*	94	Flexible
		Volume Review Exercises	14	
Volume 3	–	*Dental Instruments and Materials*	59	Flexible
		Volume Review Exercises	12	
		Supplementary Materials Fold-out Charts 1-8	45	
Volume 4	–	*Clinical Procedures*	131	Flexible
		Volume Review Exercises	14	

Supplementary Materials Required:

None

THE CENTER FOR VOCATIONAL EDUCATION
THE OHIO STATE UNIVERSITY

Expires July 1, 1978

ourse Description

his course is designed to provide training for Apprentice (semi-skilled) level people who wish to become Specialist (skilled) level workers in this career. he course contains a considerable amount of review material and is suitable for beginning students with backgrounds in the basic sciences. The course s designed to supplement laboratory or on-the-job learning situations.

he course is divided into four volumes accompanied by supplementary materials which are provided. The first volume contains several chapters on specific ilitary procedures, forms and organization. These materials were deleted in adapting the course for vocational training.

Volume 1	—	*Administration, Safety, and Maintenance* discusses the professional-client relationship and general safety practices. The chapters on administration, management, supervision and training were deleted.
Volume 2	—	*Basic Dental Sciences* covers oral anatomy, physiology, and pathology; dental therapeutics; and basic microbiology and sterilization.
Volume 3	—	*Dental Instruments and Materials* describes the uses of general, restorative, and specialty instruments; and dental materials. It is accompanied by supplementary fold-out charts.
Volume 4	—	*Clinical Procedures* describes preventive dentistry programs, dental radiology, general assisting procedures, and specialities. A section dealing with the specific Air Force preventive dentistry program was deleted.

Each volume is divided into chapters and each chapter is organized around learning objectives. These learning objectives are accompanied by text, criterion exercises and answers keyed to the text for self-evaluation. Each volume has a review examination containing questions keyed to the objectives, but no answers are provided. This material would be suitable as a supplement to laboratory and on-the-job instruction.

3

98150 01 7501

CDC 98150

DENTAL SPECIALIST

(AFSC 98150)

Volume 1

Administration, Safety, and Maintenance

Extension Course Institute

Air University

10-1

1364

12

4

DEPARTMENT OF THE AIR FORCE
UNITED STATES OF AMERICA
MCMXLVII

PREPARED BY
SCHOOL OF HEALTH CARE SCIENCES, USAF (ATC)
SHEPPARD AIR FORCE BASE, TEXAS

EXTENSION COURSE INSTITUTE, GUNTER AIR FORCE STATION, ALABAMA

THIS PUBLICATION HAS BEEN REVIEWED AND APPROVED BY COMPETENT PERSONNEL
OF THE PREPARING COMMAND IN ACCORDANCE WITH CURRENT DIRECTIVES
ON DOCTRINE, POLICY, ESSENTIALITY, PROPRIETY, AND QUALITY.

1364

5

Preface

YOU HAVE NOW progressed in the dental career field to the point where you are qualified to enroll in the 98150 CDC. The basic knowledge you have already obtained, either through formal training or on-the-job training, will prove to be invaluable as you progress upward. If you apply yourself, there are unlimited possibilities. Right now you are primarily interested in where to go from your present status. The material you will find in this volume has been compiled in an effort to assist you in attaining your goal.

As you study this volume, it will be quite apparent that it has been prepared for two distinct purposes. One purpose, of course, is to prepare you for upgrading to the 5-level AFSC. The other purpose is to create a single self-contained text that provides the study matter for the SKT portion of the Weighted Airman Promotion System. To adequately support these purposes, we have included new material that supports upgrade training and have repeated or reviewed previously taught material that is needed to prepare a comprehensive skill knowledge test.

This volume contains the first five chapters of your upgrade training. It begins with a discussion of the organization and mission of the Air Force Dental Service, the requirements for progression in the dental career field, and the duties of the various dental skill levels. The next two chapters are devoted to the administrative procedures required in the operation of a base dental service. Chapter 4 introduces you to the basic fundamentals of supervision and training. The concluding chapter of this volume reviews the principles and procedures involved in safety, housekeeping, and equipment maintenance.

Foldouts 1 and 2 are included at the back of this volume. Whenever you are referred to one of these, turn to the back of the volume and locate it.

If you have questions on the accuracy or currency of the subject matter of this text, or recommendations for its improvement, send them to USAF SHCS/MST, Sheppard AFB TX 76311.

If you have questions on course enrollment or administration, or on any of ECI's instructional aids (Your Key to Career Development, Behavioral Objective Exercises, Volume Review Exercise, and Course Examination), consult your education officer, training officer, or NCO, as appropriate. If he can't answer your questions, send them to ECI, Gunter AFS AL 36118, preferably on ECI Form 17, Student Request for Assistance.

This volume is valued at 36 hours (12 points).

Material in this volume is technically accurate, adequate, and current as of August 1974.

14

Contents

Page

Preface iii

Chapter

1 **The Air Force Dental Service** 1

2 **General Administrative Procedures** 14

3 **Administrative Support** 48

4 **Supervision and Training** 85

5 **Safety, Housekeeping, and Equipment Maintenance** 95

Answers for Exercises 121

MODIFICATIONS

Chapter 1, pages 1-13 of this publication has (have) been deleted in adapting this material for inclusion in the "Trial Implementation of a Model System to Provide Military Curriculum Materials for Use in Vocational and Technical Education." Deleted material involves extensive use of military forms, procedures, systems, etc. and was not considered appropriate for use in vocational and technical education.

General Administrative Procedures

THE DENTAL SERVICE, like other services in the Armed Forces, maintains records that are primarily for its own use. There are several reasons for keeping these dental records. The most important reason is to improve patient morale through an efficient system of appointments. Records provide an opportunity to determine the quantity of treatment provided for a given number of personnel. Information is obtained from records for the preparation of the budget. Frequently, records are employed for their legal value in supplying required information. Records also provide the information for reports, and the reports help higher headquarters plan and act. For these reasons, records should be prepared with care so that they will be accurate and factual.

The scheduling of patients for dental treatment includes receiving and directing patients and answering inquiries about clinical policies and procedures. You must not only be knowledgeable about administration but you must also be able to communicate efficiently with dental patients. This requires a basic understanding of patient psychology.

The material discussed in this chapter will be valuable to you regardless of where you are assigned in the dental clinic. This chapter discusses the reception and administration of patients, dental treatment records, dental reporting system, and miscellaneous forms and reports.

2-1. The Reception/Records Section

The reception/records section is the first point of contact between patients and dental personnel. The basic functions of this section are to receive patients, determine their treatment eligibility, schedule dental appointments, and prepare and maintain dental patient records.

006. List desirable and undesirable ways of receiving patients, identify ways of applying principles of patient psychology in receiving patients, and identify as true or false selected statements about the reception of patients.

Receiving Patients. The manner in which you receive the dental patient may have a more profound impact upon him than the actual treatment. Whatever the quality of the professional care, the patient may be resentful and dissatisfied if clinic personnel are inattentive, indifferent, or abrupt. Consequently, you should make favorable patient reaction a primary objective. A pleasant disposition, coupled with tact, and a calm, courteous, and efficient manner are essential if the patient is to feel at ease. Although the actual procedures used to process patients through dental facilities may vary in accordance with local requirements, the principles of patient psychology remain the same.

Human relations. What are human relations? Simply put, human relations are how you relate to other individuals. In many areas of endeavor, human relations are mainly restricted to getting along with coworkers. You are involved with treating people, and treating people consists of much more than curing their physical ailments. The good dental assistant never loses the awareness that patients are human beings. The needs of humans may be divided into the categories of physical and psychological requirements.

Among the major physical needs that must be satisfied are food, water, shelter, rest, exercise, sex, and physical well-being. Since the Air Force satisfies most of the physical needs of its airmen, we will concentrate our discussion on how you can deal with the psychological needs of the dental patient in receiving him. The psychological needs—sometimes referred to as social or personality needs—include security, recognition, affection, and achievement.

a. Security. People desire regularity and stability in their lives. Too much uncertainty as to how they stand creates a very unsettled condition for them. If a patient's appointment must be delayed past its scheduled time, you should inform him. Failure to do so may cause him to feel undue anxiety. He doesn't know where he stands. Has he been forgotten? Is your appointment schedule in error? Did someone fail to tell the dentist he was here for his appointment? All of these questions flutter through his mind. Keep him informed; this helps satisfy his desire for security.

b. Recognition. Every individual wants recognition and attention. We all have a desire to be looked upon favorably by others—to feel important. We crave the esteem of the people we come in contact with. Your patient does not want to be just another patient; he desires your recognition. How can we satisfy this psychological need? Well, a good start is to address your patient by his name and rank. Generally, just calling someone by his last name has a tendency to turn him off. It makes him feel that you think he is just another "fish in the barrel" and does not provide him with the recognition he wants.

c. Affection. Everyone wants to be able to have a relationship of reciprocal warm regard with his fellow man. The good dental assistant is one who genuinely likes his patients. The best way to meet this psychological need is to show a sincere interest in your patient. The first thing you must do to have affection for your patient is to like him. You do this at the outset by developing an interest in him. For every dental assistant who hopes to rise above the amateur grade, this sincere interest in the patient is the law and gospel.

d. Achievement. Everyone wants to do something worthwhile. This desire is closely related to the need for recognition. Normal individuals are happiest when they are contributing something. By informing your patient of his progress toward improved oral health, you help satisfy his psychological need for achievement. This assurance normally results in the patient displaying an ever greater interest and progress than before.

The code of ethics of the American Dental Assistants' Association is based on the principle of the Golden Rule, DO UNTO OTHERS AS YOU WOULD HAVE THEM DO UNTO YOU. Place yourself in the patient's position. Imagine his anxiety and fear toward dental treatment. Have empathy toward him. Seldom does an individual have too much security, recognition, achievement, or affection.

The reception area of the dental service provides the patient with his first impression of the type of treatment he is going to receive. This first impression is an important one. Often, the finest professional care in the world cannot erase the tarnished image that a lackadaisical receptionist has created. The dental receptionist should be a calm, well-groomed, articulate individual who strives to present a good first impression of the dental service to each patient.

The very heart of the term "dental service team" is the word "service." When performing your services as a dental receptionist, keep in mind that the patient is unaware of the procedures required for treatment. You must listen to each patient's problems, and determine how and where to route him for professional care. You should explain this routing to him so that he knows where he stands and what to expect. Listening to the patient and explaining the procedures for his individual case can eliminate many future misunderstandings and problems.

When misunderstandings do occur, you must take positive action to resolve them with as little commotion as possible. You must use tact and diplomacy when dealing with an upset patient. Normally, this type of patient is acting under abnormal stress, and it is difficult to rationalize with him. In handling the upset patient, it pays you to remember the expression: "When fire blazes in the body, sparks often come out of the mouth." You must guard against this happening to you. Losing your temper gains nothing. If you find that you cannot satisfy the patient, excuse yourself and have a senior NCO or an officer speak with him. Usually, the patient will be more receptive to someone in a position of greater authority. Above all, do not get yourself involved in an argument with the patient.

Exercises (006):

1. What three attitudes should you avoid when receiving a patient if you want to see that he does NOT become resentful or dissatisfied?

2. What qualities should you display when receiving patients if you want to make them feel at ease?

3. Into what two categories may the needs of individuals be divided?

4. List seven major physical needs which must be satisfied.

5. What are four psychological needs that must be dealt with in the reception of dental patients?

In the next four exercises, identify ways you can apply the principles of patient psychology in the reception of patients by matching the letters of desirable actions in column B with the psychological needs they best fulfill in the proper blank of column A. (One action *cannot* be matched correctly.)

Column A

__6. Achievement.
__7. Affection.
__8. Recognition.
__9. Security.

Column B

a. Address patient by name and rank to make him feel important.
b. Address all patients by last names only.
c. Keep patient informed in case his appointment is delayed beyond the scheduled time.
d. Inform patient of his progress toward improved oral health.
e. Show a sincere interest in patient from the outset.

Indicate which of the next seven statements are psychologically true and which are psychologically false by inserting a T or an F in the blanks provided.

___ 10. Having empathy for your patients helps achieve the Golden Rule of the American Dental Assistants' Association.

___ 11. The ideal receptionist is concerned with providing the patient with a good first impression of the dental service.

___ 12. Sex, shelter, rest, recognition, and exercise are all physical needs.

___ 13. The very heart of the term "dental service team" is the word "service."

___ 14. Most individuals have too much security, recognition, achievement, and affection.

___ 15. Part of the service you can render as a receptionist is to listen to each patient's problems, determine how and where to route him for professional care, and make any necessary explanations to him.

___ 16. It is well to be firm with an upset patient, even to the point of showing temper; argue your point effectively if you are right and, above all, keep him in his place.

007. Given a series of statements about the general principles of telephone communication, indicate which are true and which are false.

Telephone manners. Other than face-to-face conversation, the telephone is the most frequently used method of personal communication. It is one of the most important pieces of equipment in the clinic. All of the elements of good human relations already discussed apply also to telephone conversations; however, since the person to whom you speak on the telephone cannot see you, this can lead to certain difficulties. Here are some general principles to remember which will be helpful in overcoming or preventing these difficulties:

a. You are the Dental Clinic when you speak on the telephone. The opinion the patient has of the entire hospital may often depend on this first telephone contact. Use the telephone as a representative of a dental service eager for the opportunity to help someone.

b. Use a sincere, pleasant, easy-to-understand voice. Since the person on the other end cannot see you smile, you must put the smile in your voice. Develop this habit to the point that you do it unconsciously.

c. Answer promptly. A good rule is to try to answer by the third ring.

d. Be clear, concise, and accurate. Doublecheck all specific information given or taken on the telephone. If you initiate the call, plan what you have to say ahead of time. The other person's time is also valuable.

e. State your name, rank, and duty section, such as: "Good morning, Dental Clinic, Sgt Smith speaking. May I help you?"

f. Know the local ground rules. Most clinics have specific ways of answering the telephone. They also have certain limitations as to the information that can be given over the telephone. Be sure you know the rules and have all the necessary information at your fingertips, especially information about appointments.

g. Never diagnose on the telephone. Diagnosis is not your function. The patient, however, does not know your qualifications; if the information required by the caller is out of your area of responsibility, call the proper authority or set up an appropriate appointment in accordance with the local rules.

h. Never prescribe on the telephone. Obtain accurate information if the dentist is busy, and determine whether the nature of the call is administrative or professional.

i. Record calls. If the telephone message is for someone who is not available at the time, or if it requires information that needs further investigation, be certain that the information is accurately and completely recorded. A convenient form (SF 63, Memorandum of Call) is available for this purpose. These forms come in pads, and if you need to keep a record of calls, slip in a piece of carbon paper.

Exercises (007):

Indicate which of the following statements are true and which are false by inserting a T or an F in the blanks provided.

__1. There are no special problems connected with telephone mannerisms, since the person to whom you are speaking cannot see you.

__2. When you speak on the telephone, you should speak as a representative of a dental service who is eager for the opportunity to help.

__3. It is important that your telephone voice be businesslike—never give a hint of a smile by the tone of your voice.

__4. Concentrate on the task you are doing; if the phone rings, the caller can call back after you finish.

__5. A caller's time it too valuable for you to ever doublecheck specific information given or taken on the telephone.

__6. There are local ground rules and limitations as to information you should give on the telephone.

__7. It is your function to diagnose; therefore, there are times when it is both diplomatic and proper for you to diagnose over the telephone.

__8. You should *never* diagnose *nor* prescribe on the telephone.

__9. In some cases, you should keep a record and a duplicate of certain telephone messages.

~~**008.** Given a list of types of dental care needed, match each with the proper type of dental attendance in another list. Designate the correct order of priority for the dental attendance of individuals in specific categories.~~

~~**Determining Treatment Eligibility.** Who is authorized dental care? If a person in civilian clothes came to your clinic requesting treatment, what would you do? How could you determine his eligibility for treatment? The easiest way is to look at his identification card. You can then determine whether he is on active duty, a reservist, a retiree, or a civilian. All of these categories are authorized some type of treatment. To determine a patient's treatment eligibility, you must know the types of dental attendance available and the categories of patients that are authorized treatment.~~

~~*Types of dental attendance.* There are two types of dental attendance—general and emergency. The types of attendance indicate the scope of treatment provided.~~

~~*a.* General dental attendance. This includes all the medical, surgical, and restorative treatment of oral diseases, injuries, and deficiencies that come within the field of dental and oral surgery as commonly practiced by the dental profession. This service is preventive and corrective. It includes:~~

~~(1) Dental examinations and advice on dental health.~~
~~(2) Restoration of lost tooth structure.~~
~~(3) Treatment of periodontal conditions.~~
~~(4) Surgical procedures.~~
~~(5) Replacement of missing teeth essential to personal appearance, the performance of military duty, or the proper mastication of food.~~

~~*b.* Emergency dental attendance. This is the dental care rendered for humane reasons to relieve pain, to treat acute septic conditions, or to care for painful injuries to the oral structures. Emergency dental care is authorized worldwide for personnel of all categories.~~

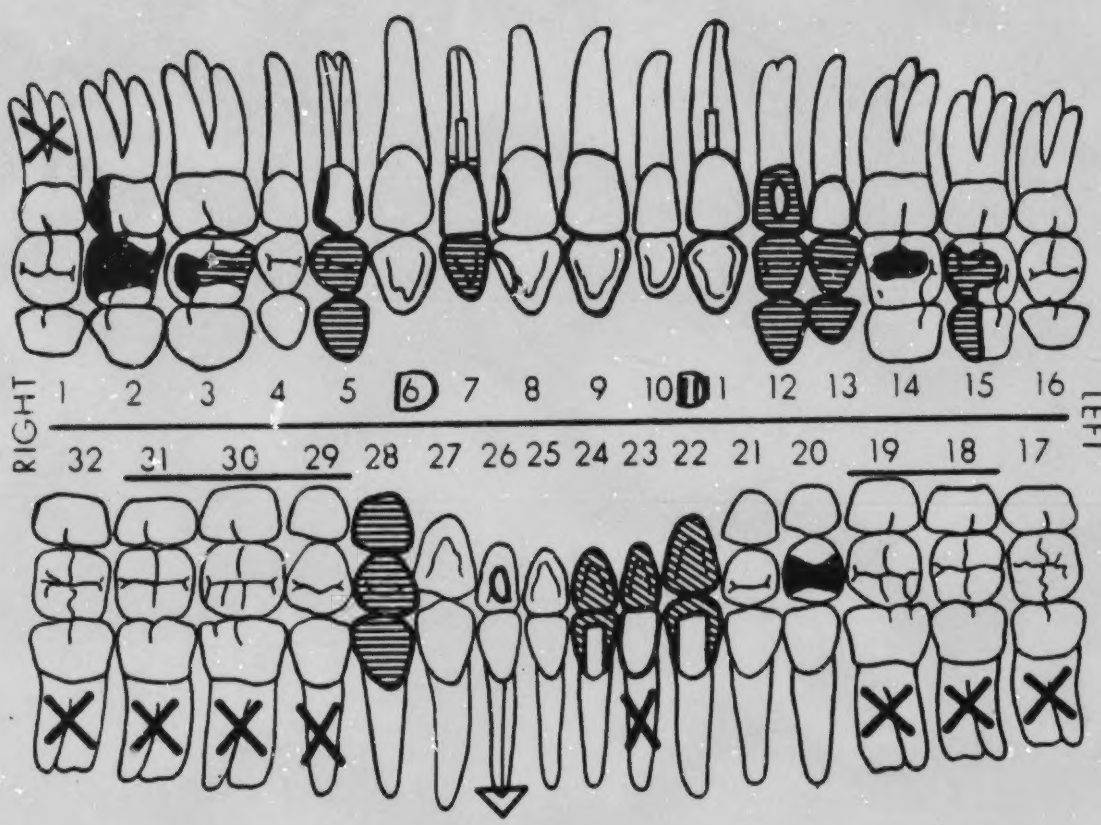
~~*Patient categories authorized treatment.* Dental care is authorized for various categories of persons at Air Force dental facilities subject to the following limitations:~~

~~*a.* Active duty military personnel. Air Force personnel and other members of the uniformed services on active duty are authorized general dental attendance in Air Force dental facilities. Uniformed service members must use the facilities of the parent organization or service if the facilities are available and capable of providing the care required. Personnel of one service assigned to duty with another service are given outpatient treatment on the same basis as personnel of the service rendering the treatment.~~

~~*b.* Retired members of the uniformed services. Retired members of the uniformed~~

MODIFICATIONS

Pages 18- 24 of this publication has (have) been deleted in adapting this material for inclusion in the "Trial Implementation of a Model System to Provide Military Curriculum Materials for Use in Vocational and Technical Education." Deleted material involves extensive use of military forms, procedures, systems, etc. and was not considered appropriate for use in vocational and technical education.



#1. Tooth Missing.
#2. Mesio-Occluso-Disto-Facial Amalgam.
#3. Combination Restoration, Amalgam and Gold.
#5. Three-Quarter Crown and Root Canal Filling.
#6. Deciduous #6 present in place of permanent #6. (For impacted permanent #6, circle as shown for tooth #32, figure 2, on chart, "Diseases and Abnormalities.")
#7. Richmond Crown. Facing may be porcelain, acrylic, or silicate filling material. Post and Root Canal Filling.
#8. Distal Non-Metalic Restoration.
#9. Non-Metallic Jacket Crown.
#10. Retained Deciduous Cuspid between permanent teeth #10 and #11.
#11. Non-Metallic Post Crown.
#12. Open Face Gold Crown.
#13. Gold Crown with Non-Metallic Facing.
#14. Occlusal Amalgam.
#15. Meso-Occluso-Lingual Gold Inlay.
#18 and #19. Teeth missing, replaced by removable partial denture.
#20. Mesio-Occluso-Distal Amalgam.
#22, #23, and #24. Fixed Partial Denture. Three-quarter gold crown on #22 and #24, supporting a pontic replacing #23 with non-metallic facing.
#26. Lingual Non-Metallic Restoration. Root Canal Filling and Apicoectomy.
#28. Full Gold Crown.
#29, #30, and #31. Teeth missing, replaced by removable partial denture.
#32. Tooth missing.

Figure 2-1. Charting of missing teeth and existing restorations.

~~Treatment consisted of removing the old restoration and replacing it with a new amalgam restoration.~~

~~35. The patient is suffering from an acute and a severe periapical abscess of the maxillary right central incisor. Treatment consists of removing the tooth. Regional anesthesia was administered.~~

017. Given a chart showing the surfaces and roots of various teeth, and a list of dental

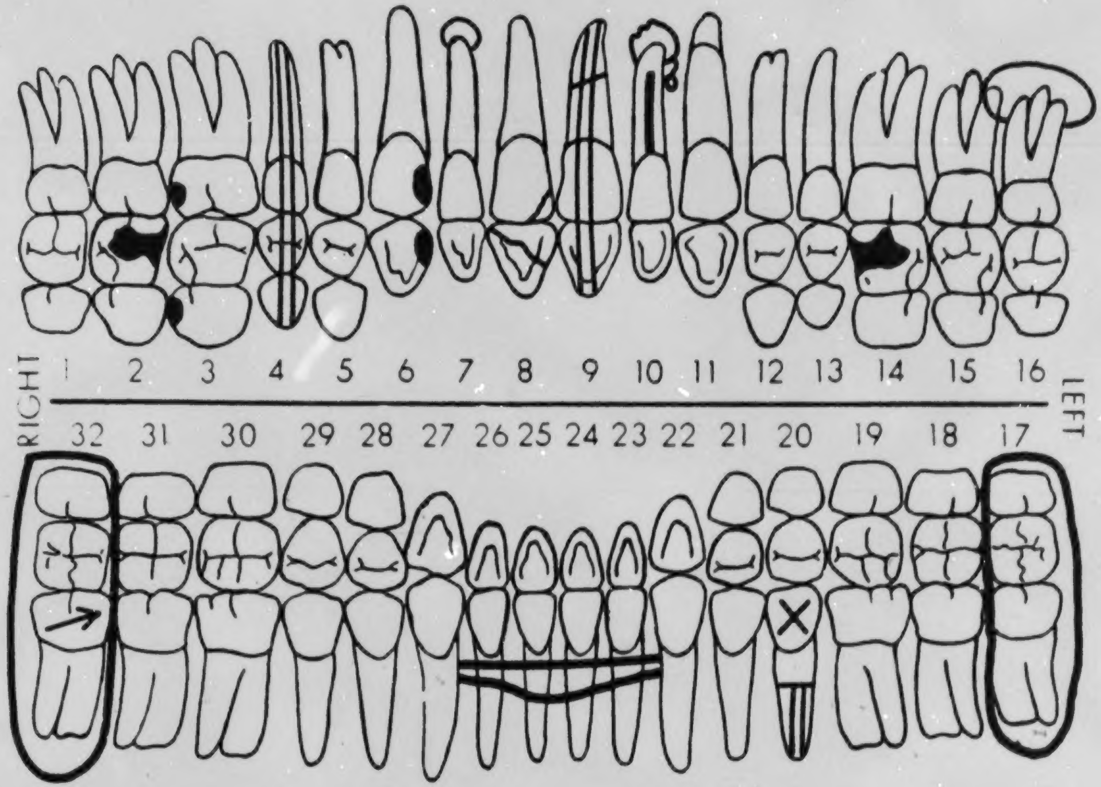
conditions, mark the chart with the symbols used to depict these conditions.

Charting Symbols. Although you are probably familiar with the frequently used charting symbols, a comprehensive review of them is in order. Figure 2-1 shows charting symbols that are used to depict missing teeth and existing restoration, while figure 2-2 shows charting symbols that illustrate diseases and abnormalities.

If you compare the entries in figures 2-1 and 2-2, you will find that certain of these symbols may be used to indicate either a defect or a restoration. Such double use of a single symbol will not, however, result in confusion on SF 603, as separate charts are provided for defects and restorations. Any attempt to use the symbols to chart dental records that have only a single chart will make it impossible to determine whether the symbol is intended to show a defect or a restoration.

Charting missing teeth. The guidelines for charting missing teeth are as follows:

a. Edentulous Arch or Mouth. Inscribe two crossing lines, each running from the uppermost aspect of one third molar to the



#2. Mesio-Occlusal Caries.
#3. Distul Caries.
#4. Extraction indicated.
#6. Mesial Caries.
#7. Abscess Periapical.
#8. Fractured Crown.
#9. Fractured Root—Extraction indicated.
#10. Abscess and Fistula, underfilled root canal filling.
#11. Resorbed Root.
#14. Defective Restoration—Outline includes area of restoration to be replaced and defective area.
#16. Cyst Involving #15 and #16.
#17. Unerupted Tooth. (If not visible in oral cavity, an "X" would appear on corresponding tooth on chart "Missing Teeth and Existing Restorations.")
#20. Residual Root requiring removal.
#23 through #26. Gingival Crest—Continuous line. Alveolar Crest—Continuous line.
#32. Impacted Tooth with mesial inclination. Direction of arrow will indicate degree of inclination.

Figure 2-2. Charting of diseases and abnormalities.

lowermost aspect of the third molar on the opposite side.

b. Individual Missing Teeth. Draw an X on the root or roots of each natural tooth that does not appear in the mouth at the time of examination. This applies to unerupted, extracted, or congenitally absent teeth, regardless of whether they have been replaced by fixed or removable partial dentures.

c. Deciduous Teeth. If only the deciduous tooth is present, inscribe a block letter D around the number of the corresponding permanent tooth. If both the deciduous tooth and the permanent tooth are present, show their relative positions on the chart. Indicate the position of the deciduous tooth by placing the number of the permanent tooth in the relative position that the deciduous tooth occupies; inscribe a block letter D around it.

Charting restorations. In the diagram of the tooth, draw the restoration and show the approximate size, location, and shape. Identify restorative procedures and prostheses in accordance with the instructions below.

a. Amalgam Restoration. Outline and block in solidly. Chart proximal restorations in posterior teeth on facial and lingual surfaces only when the restoration extends onto these surfaces to a greater extent than is necessary for the prevention of recurrence of decay.

b. Gold Restoration. Outline and inscribe horizontal parallel lines within the outline of the restoration.

c. Nonmetallic (Silicate, Porcelain, Acrylic Restorations, Artificial Crowns, and Facings). Draw only outline of size, location, and shape of restoration and each aspect of the crown or facing.

d. Combination Restoration. Outline area, showing approximate overall size, location, and shape; partition at junction of materials used. Show each type of material used.

e. Post Crown. Outline each nonmetallic material and show restorative metallic materials. Outline approximate size and position of the post or posts.

f. Root Canal Filling. Outline each canal filled, and block in solidly.

g. Apicoectomy. Draw a small triangle, apex away from the crown and base line at the approximate line of the root amputation.

h. Dentures. Place a horizontal line between the outline of the teeth and the numerals designating teeth replaced by removable partial dentures only. Under Remarks, describe full and removable partial dentures, indicating whether maxillary or mandibular; the type of restoration; and the denture base material. In chrome-cobalt cases, give the type for possible future repair purposes. State whether the restoration is serviceable or unserviceable.

i. Fixed Partial Dentures. Outline each aspect, including abutments and pontics. Show partition at junction of materials and show each material used, except gold, as indicated above; show gold by inscribing diagonal parallel lines instead of horizontal parallel lines. Note defective fixed partial dentures under Remarks. Example: Defective pontic #10 or defective artificial crown #11.

j. Remarks. Under Remarks, add any other pertinent remarks relating to missing teeth and existing restorations.

Charting diseases and abnormalities. The following guidelines indicate the authorized method for charting diseases and abnormalities. Care is necessary to insure that you do not enter these symbols in record areas designated for missing teeth and restorations. Entering these symbols in the wrong area would prevent differentiation between the caries and the restorations.

a. Caries. On the diagram of the tooth affected, draw an outline of the carious portion, showing approximate size, location, and shape; block in solidly.

b. Extraction (Removal) Indicated. Draw two parallel vertical lines through all aspects of the tooth and roots involved. This applies also to unerupted teeth when removal is indicated. In case of a retained root, draw two parallel lines in the direction of the long axis of the root through the part that is retained. Indicate the missing portion of the tooth with an X.

c. Abscess or Cyst. Outline approximate size, form, and location.

d. Fistula. Draw a straight line from the abscess area, ending in a small circle in a position on the chart corresponding to the location of the fistulous opening into the mouth.

e. Unerupted Tooth. Outline all aspects of the tooth with a single oval.

f. Fractured Tooth. Trace a jagged fracture line in the relative position on the crown or roots. When removal is indicated, chart is outlined in *b* above.

g. Periodontitis and/or Alveolar Resorption. Indicate extent of gingival recession with a continuous line drawn across the roots in the areas involved. In the case of active periodontal disease, place an X in the proper box under "B. Periodontoclasia." Indicate the extent of alveolar resorption by drawing another continuous line across the

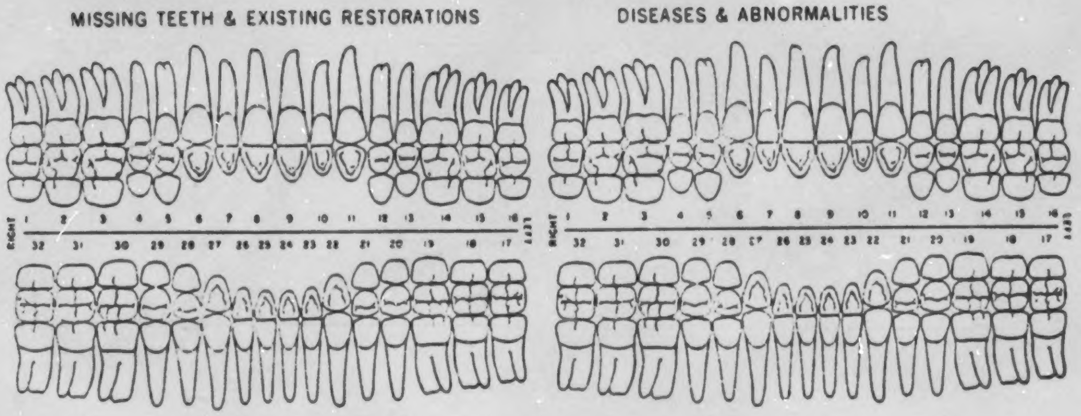


Figure 2-3. Charting exercise (objective 017, exercise 1).

roots of the teeth at the proper level, based on clinical and radiographic findings.

h. Resorption of Root. Draw an even line showing extent of resorption of root. Note charting of fractured tooth as given in *f* above.

i. Defective Restoration. Outline the defective restoration, including the carious or otherwise defective area, and block in solidly.

j. Inclination of Impacted Teeth. Place an arrow in the crown portion of the tooth form, showing the direction of the long axis of the tooth.

k. Abnormalities of Occlusion and Remarks. Describe malocclusion and any other pertinent remarks pertaining to diseases and abnormalities that are found. Comments about therapeutic radiation to the oral or perioral structures when considering prosthetic treatment are particularly noteworthy.

l. Special Entries for Identification. Record under Remarks findings such as erosion, abrasion, mottled enamel, hypoplasia, Hutchinson's teeth, rotation, irregularity of alignment, drifting or malocclusion of teeth, presence of supernumerary teeth, abnormal interdental spaces, mucosal pigmentation, leukoplakia, diastema, torus palatinus or mandibularis, embedded foreign bodies, and unusual restorations or appliances. These entries are important for diagnostic and identification purposes.

Exercises (017):

1. Record the following conditions by placing the proper symbols on figure 2-3.

#1 Tooth missing.
#2 Mesio-occluso-lingual gold inlay.
#3 Defective distal-occlusal restoration.
#3 Distal-occlusal amalgam.
#4 Extraction indicated.
#5 Open-faced gold crown.
#6 Nonmetallic jacket crown.
#7 Mesial nonmetallic restoration.
#7 Distal caries.
#8 #9, #10 Fixed partial denture. Three-quarter crown on #8 and #10 supporting a pontic replacing missing tooth #9 with a nonmetallic facing.
#11 Retained deciduous cuspid between permanent teeth #10 and #11.
#12 Cyst involving #12 and #11.
#14 Full gold crown.
#15 Tooth missing.
#16 Unerupted tooth.
#17 Mesio-occlusal amalgam.
#18 Abscess periapical.
#19 Occlusal amalgam.
#20 and #21 Teeth missing, replaced by a removable partial denture.
#22 Lingual nonmetallic restoration. Root canal filling and apicoectomy.
#23 Mesial caries.
#24 and #25 Teeth missing, replaced by a removable partial denture.
#27 Residual root requiring removal.
#28 Mesio-occluso-distal caries.
#29 and #30 Teeth missing, replaced by a removable partial denture.
#32 Impacted tooth with 45° mesial inclination.

~~018. Fill in the blanks in statements about the purpose and maintenance functions involved with DD Form 722-1, Dental Folder—Health Record.~~

MODIFICATIONS

Pages 32- 94 of this publication has (have) been deleted in adapting this material for inclusion in the "Trial Implementation of a Model System to Provide Military Curriculum Materials for Use in Vocational and Technical Education." Deleted material involves extensive use of military forms, procedures, systems, etc. and was not considered appropriate for use in vocational and technical education.

10

Safety, Housekeeping, and Equipment Maintenance

AN IMPORTANT aspect of your job is to provide a neat, clean, and safe environment for your patients and fellow workers. To furnish this type of environment, you must maintain a tidy work area, keep your equipment in good repair, and conduct yourself in a safe manner. We begin this chapter with a discussion of the principles of safety. By following these principles, you'll be able to protect yourself, your coworkers, and your patients from needless injury.

5-1. General Safety Principles

We all know that everyone makes mistakes. Some mistakes are of little significance, but others have led to loss of limb and to loss of life. Therefore, the discussion of nine principles of safety that follows is offered in an attempt toward making you safety-conscious while you work.

070. State who teaches the training you need before operating equipment, the first principle of safety when using new or familiar equipment, and a way to familiarize yourself with new equipment without relying solely on your supervisor.

Preoperational Training. Naturally, a man must know the proper way to operate equipment if he is to do it safely. Preoperational training, as the name implies, is the training a man should receive before he operates equipment. It is necessary before operating any Air Force equipment, whether it is a handpiece, powersaw, forklift, or screwdriver. You are taught this either in a formal technical course or by your supervisor in on-the-job training—perhaps both, as time goes on.

Preoperational training is especially important if you acquire new equipment. Don't assume that because you are a skilled operator of the old equipment, you can proceed immediately to operate the new equipment. Since such things as operating speeds, operating controls, and guards may differ, the wise thing to do is to read the operating instructions for the new equipment very carefully. This first principle of safety demands that you know your equipment and know how to operate it safely! Be sure to ask your supervisor for instructions or read the operating instructions before you operate any new or unfamiliar equipment.

Exercises (070):

1. Who teaches the training you should receive before you operate equipment?

2. What is the first principle of safety regarding the use of either new or familiar equipment?

3. What is an alternate way for you to familiarize yourself with new equipment other than by relying solely on your supervisor?

071. Define "self-discipline" as it relates to safety and state who has the primary responsibility for performing a safety check of equipment in your work area.

Discipline. The second major principle of safety is discipline. You learned in basic military training how important good discipline is in the classroom and in the execution of close-order drill. It is even more important whenever there is a threat to your personal safety.

For convenience, let's define good discipline simply as law observance. Now, there is another kind of discipline—law enforcement. Law observance comes from within yourself; in contrast, law enforcement comes from the outside. Being arrested for speeding is an example of outside discipline. However, if you observe the speed limits, you have exercised self-discipline, another name for law observance.

Of course, self-discipline is best. For one thing, it means that you are thinking for yourself. On the other hand, outside discipline, or law enforcement, means that someone else is doing your thinking for you. So, for our purposes, the meaning of good discipline is self-discipline.

To illustrate the point of self-discipline, let's consider electrically powered equipment. In any facility, the supervisor and the personnel working under him should check electrically powered equipment for frayed wiring, loose connections, and proper grounding. But who has the primary responsibility for checking the equipment in your work area? The answer, of course, is you. This is because the supervisor simply cannot check all equipment each time before it is used. Consequently, you must use self-discipline in this area unless you wish to risk your life.

Exercises (071):

1. What is meant by the term "self-discipline" as it relates to safety?

2. Who has the primary responsibility for performing a safety check of equipment in your work area?

072. Given statements about the general safety principle of alertness, indicate which are true and which are false.

Alertness. So far, you've learned about two major principles of safety: preoperational training and discipline. A third principle of very great importance is alertness. Constant alertness is a prime requisite in avoiding accidents.

Fundamentally, alertness means "paying attention" to what you're doing—not just "now and then" but all the time. Unless you pay close attention, you may do something wrong that will cause an accident.

The principal enemies of alertness are external and internal distractions—distractions that occur outside of you and distractions that occur inside of you, either mentally or physically. You must do your best to keep from being sidetracked by every distraction that comes your way.

Exercises (072):

Mark each of the following statements with a T or an F in the blanks provided to show whether it is true or false.

_ 1. Alertness is of minor importance in avoiding accidents.

_ 2. The principal enemies of alertness are external and internal distractions.

073. Given a list of unsafe working practices that should be avoided and another list of work situations, match each unsafe practice with the work situation to which it applies.

Avoiding Unsafe Practices. The three major principles of safety you have studied so far are preoperational training, discipline, and alertness. A fourth major principle involves avoiding unsafe practices. Of course, preoperational training, discipline, and alertness will help you to avoid unsafe practices; but, at the same time, it's well to know just what unsafe practices are. While it would not be practicable to discuss every kind of unsafe practice, we can consider some of the most common types of unsafe practices that occur in operating equipment, using tools, and handling materials, along with the general safety principles that apply.

According to the National Safety Council, faulty handling of material is the major source of injuries on the job. Most of these injuries are back injuries caused by improper lifting of heavy objects. When lifting heavy objects, the main point to remember is don't bend your back if you can avoid it. Keep your back as straight as possible. The idea is to "lift with your legs, not your back." Squat down, get a good grip underneath the object, then lift slowly with your legs.

Another unsafe practice is working too fast. You can work too fast at any job you do in the Air Force. However, you should work at a moderate, consistent pace whenever possible. Undue haste may cause a mistake in judgement, resulting in an accident.

Still another unsafe practice is using a handtool or instrument for a purpose other than that for which it was designed. For example, it is unsafe to use a dental chisel as a screwdriver. Its cutting edge is likely to slip off the screw and lacerate some part of your body, and you will also ruin the chisel.

The way you use knives can also be an unsafe practice. It is always unsafe to cut toward yourself. A slight slip can cause you to cut yourself severely. Thus, always cut away from yourself after making sure no one else is in the cutting path.

Exercises (073):

Match each unsafe practice listed in column B that should be avoided by placing a letter from this column beside the work situation to which this *unsafe* practice applies in column A. Match one blank twice. Three practices in column B are safe, so do not enter their letters.

Column A	*Column B*
_ 1. Lifting objects.	a. Cut away from yourself and others.
_ 2. Working at correct pace.	b. Bend your back but not your legs.
_ 3. Using handtools or instruments for approved purposes only.	c. Get a good grip on the top of the object; lift suddenly, with the back serving as a fulcrum.
_ 4. Using knives.	d. Use a handy dental chisel to loosen a screw.
	e. Performing a task so rapidly that a mistake in judgement occurs.
	f. Lift with your legs, not your back.
	g. Work at a moderate, consistent rate.
	h. Keep the cutting edge toward you.

074. Given statements about the general safety principle of mental and physical fitness, identify each true statement with a T and each false statement with an F.

Mental and Physical Fitness. Maintaining mental and physical fitness is the fifth principle involved in avoiding accidents and promoting safety on the job that we shall discuss.

Mental fitness. The mental fitness aspect is complex, to say the least. Much has been written about the subject, and there are many different views about it. Generally speaking, mental fitness may be approached in a similar way as physical fitness. Just as your physical body needs proper nutrition, exercise, and rest, so does your brain. Make sure that you use only properly prescribed drugs, engage in well-balanced mental activities, and get appropriate rest.

Physical fitness. Just as impaired mental fitness can result in accidents, so can impaired physical fitness. Get plenty of rest before each day's work, eat balanced meals, and participate routinely in a physical exercise program. Faulty sight or hearing is a prime cause of accidents. If you notice blurred vision or a decrease in hearing, arrange for a medical appointment so the defect can receive attention. Always do all you can to stay as healthy as possible. This will reduce the probability of accidents as a result of physical deficiencies; it will also relieve you of worries about your physical condition—and worrying can decrease alertness and cause accidents.

Exercises (074):

Insert a T or an F besides each of the following statements to indicate whether it is true or false.

_ 1. Poor mental fitness and poor physical fitness are NEVER causes of accidents.
_ 2. Mental fitness includes the following: using only prescribed drugs, engaging in well-balanced mental activities, and getting appropriate rest.
_ 3. Staying as healthy as possible will reduce mental worries that could cause accidents.

075. Complete the blanks in statements dealing with avoiding physical hazards.

Hazard Avoidance. The sixth major safety principle is to eliminate, minimize, or avoid physical hazards. Now, every job situation has its own peculiar physical hazards. Since there are thousands of jobs in the Air Force, we can consider only a few representative examples.

Equipment and instrument hazards. Among the important physical hazards you may expect to encounter in the dental clinic are the dangers imposed by the moving parts on equipment and the hazards associated with dental instruments. However, proper handling and precautions on your part can either eliminate or minimize the hazards involved. Most dental equipment hazards can be dealt with by making maximum use of the guards and shields that are provided. The hazards associated with dental instruments can be minimized by positive instrument control (proper instrument-passing techniques and proper instrument grasps).

Fire hazards. A major physical hazard is fire. Many different factors can cause a fire, which is the common name for the chemical reaction known as combustion. Fire is really a chemical reaction between two or more substances. Three elements are necessary in order for the chemical reaction of combustion to take place: fuel, oxygen, and heat.

Before you can have a fire, you must have something that will burn. That something is called fuel. In order for combustion to occur, you must also have oxygen, which is usually supplied from the oxygen in the earth's atmosphere. But fuel and oxygen alone are not enough—the third requirement is heat. Therefore, if you have fuel that is hot enough and sufficient oxygen is present, you will have combustion—or fire.

This leads us to the main point concerning combustion—if you take away any one of the three things necessary for combustion, you will not have a fire. Thus, oxygen and heat are not enough—there's no fuel to burn. Likewise, you will have no fire with just oxygen and fuel—if the fuel isn't hot enough to burn. The secret of extinguishing a fire is to remove any one of the three elements, and the fire will die out. But better still, keep all three of these elements from getting together simultaneously and you will prevent a fire from starting.

Exercises (075):

Enter an appropriate word in the blanks provided to complete each of the following statements.

1. Eliminate, minimize, or ______ the peculiar physical hazards associated with your job situation.

2. Most dental equipment hazards can be dealt with by making ______ use of the guards and shields that are provided.

3. Positive instrument control, as reflected by proper instrument-passing techniques and proper grasp of the instruments, can ______ the hazards associated with dental instruments.

4. Eliminate any one of the three elements necessary for combustion and you will ______ an existing fire. Prevent all three elements (fuel, oxygen, and heat) from getting together simultaneously and you will ______ a fire.

076. Given statements concerning the general safety principle of proper equipment maintenance, identify each true statement with a T and each false statement with an F.

Proper Equipment Maintenance. The seventh major principle of safety is to keep machines and equipment in good operating condition. If any machine is not in good condition, one or both of the following situations may occur: (1) loss of job efficiency, since you won't be able to turn out as much work; (2) a safety hazard.

Regardless of the piece of equipment that you may be operating, watch out for any "play" that may result from such conditions as nuts becoming loose, parts becoming worn, or working parts getting out of adjustment. Any of these conditions can cause play to develop, and this could become a safety hazard (because of parts falling off, for instance).

If you're using any kind of cutting tool or are operating a machine used as a drill, the cutting edges should be sharp. Any tool or machine cutting edge that is dull may slip, break, or otherwise malfunction and cause an injury.

On electrically operated machines, switches should be in top condition. A defective switch might be an electrical hazard resulting in a shock, or it might keep you from stopping a machine when you want it stopped, and thus cause an accident.

Before operating any machine or piece of equipment, become thoroughly familiar with its parts and become especially familiar with the safety hazards that may develop as a result of defective or worn parts. Know what hazards to look for and look for them frequently. Equipment maintenance is discussed in more detail later in this chapter.

Exercises (076):

Mark each of the following statements with a T or an F in the blanks provided.

_ 1. A sharp cutting edge on a tool is more likely to malfunction and cause an injury than a dull edge.

_ 2. "Play" caused by nuts becoming loose (or by worn or out-of-adjustment parts) can cause a piece of equipment to become a safety hazard.

077. Given a list of descriptions of working conditions, select those that are desirable for a safety-oriented environment by matching each desirable condition with the applicable environment item given in another list.

Safety-Oriented Environment. The eighth major principle of safety is that the operating or working environment should be conducive to safety. Your immediate surroundings (environment) can help or hinder you from a safety standpoint. Under the topics of physical fitness and physical hazards, we have discussed several elements of the total environment. Now, let's look at certain other elements.

One of these elements is good housekeeping. Just as you find it advantageous to live in a well-kept household, so you will find it equally desirable to work in a well-kept working environment. Both are conducive to safety.

One of the elements of good housekeeping is disposal of waste and scrap. If floors or workbenches are cluttered by such material, the chances of an accident occurring are definitely increased. It is important to keep floors and workbenches clean, especially from such matter as oil, grease, paints, chemicals, radioactive materials, and any thing else that may pose a safety hazard. You should also keep handtools and machine tools clean. If they are greasy, for example, they may slip and cause an accident. Aside from keeping items clean, good housekeeping means keeping tools, materials, and other items you use properly stored in good order. A working environment that is cluttered with tools and materials poses a safety hazard.

The layout of equipment is another important safety factor. Equipment should be positioned so that the operator will have sufficient space to handle stock (the materials he's working on) without creating a hazard to himself or others. The equipment layout should also be such that the operator will not face doorways, halls, windows, or other distracting areas. As you learned earlier, one major principle of safety is "constant alertness." Facing any distracting area may tend to diminish alertness and divert attention from the job.

Exercises (077):

Match each desirable condition listed in column B with the appropriate reference to a safety-oriented environment listed in column A in the blanks provided. Do not match the two undesirable conditions listed in column B.

Column A

_ 1. Good housekeeping.
_ 2. Layout of equipment not directly involving housekeeping.

Column B

a. Floors or workbenches cluttered with waste and scrap.
b. Keep floor and workbenches free of grease, oil, chemicals, or radioactive materials.
c. Keep hand or machine tools clean, properly stored, and in good working order.
d. Position equipment so that the operator has sufficient working space without creating hazards.
e. Position equipment so that operator faces doorways, halls, and windows, and can be alert to what is happening around him.

078. State the factor that determines the amount of preoperational planning that is necessary in order to observe proper safety precautions, and specify what items your check of safety instructions may include before you start a job.

Preoperation Planning. The ninth and last principle we shall discuss is this: Proper planning must precede operation. No matter what you are getting ready to do, you should think about it and plan your activity properly so that you observe necessary safety precautions. The amount of advance planning you do depends, of course, on the nature of the task. Some jobs require more advance planning than others. But all tasks warrant a certain amount of planning ahead.

Doubtless, the most important thing to bear in mind when planning to begin a job is to check any pertinent safety instructions. These may concern the materials you will work with, protective clothing, machine guards, and the type of machine or equipment that you will use. Be sure to study safety instructions carefully, especially if the job or equipment is new. As you begin each day's work, even on comparatively simple tasks that you are familiar with, it's a good idea to plan ahead to be sure that all pertinent safety principles are being observed. If guards, protective clothing, and other protective items are called for, are they available to you? In brief, is everything "shipshape" for the day's work?

Whatever the job you are assigned to, look for the nine principles of safety you have just studied. If your unit is "safety conscious," you'll find them. If not, it's up to you to help make the unit safety conscious. Remember, "The life you save may be your own." In everything you do, "always be careful."

Exercises (078):

1. What determines the amount of preoperational planning that is necessary in order to observe proper safety precaution?

2. Before you begin a job, you should check pertinent safety instructions. What may these instructions deal with?

5-2. Items Requiring Safety Precautions

The nine general safety principles we have discussed may be applied (at least in part) to any environment. But in the dental clinic environment, there are specific items that require special attention for safety purposes. Among these items are gasses, electrical wiring, burn hazards, slippery floors, and adverse personal behavior.

079. Given a list of references to factors in the dental clinic environment which may involve safety hazards and given another list of descriptions of safety precautions against these hazards, match each reference in one list to the applicable precaution in the other list.

Gasses. Commonly, gasses are used for two different purposes in Air Force dental clinics. One is the oxygen used for dental emergencies, and the other is either natural or prepared gas used for fuel in burners and heating systems.

As mentioned earlier, oxygen is one of the three items necessary for fire. Therefore, you must be extremely careful in handling oxygen equipment. In this respect, never handle oxygen equipment in such a reckless manner as to produce sparks. This means that you must store oxygen tanks in a secure, upright position and that you must not use wrenches on oxygen control mechanisms. Sparks caused by falling oxygen cylinders or by wrenches slipping from oxygen controls have started tragic fires.

Naturally, you should respect natural or propane gas as you would oxygen; sparks can ignite this gas also. Even a small leak could soon fill a room and present danger in two ways. First, prolonged breathing of gas vapors causes the gas to enter the bloodstream and eventually reach the brain. This can result in impairing one's judgment and may lead to unconsciousness. To keep this from happening, you must respond quickly and decisively to gas leaks. That is, you must make sure that the smallest leak (detectable by smell) is reported and adequate fresh air ventilation is established.

The second danger posed by a natural or propane gas leak is a potential fire. Careless or thoughtless lighting of a cigarette lighter or match in a gas-filled room is certain to cause an instantaneous fire (explosion). To prevent this type of fire hazard, follow the procedures that were given for preventing the hazards of breathing gas vapors, but go one step further. Make sure that you spread the alarm quickly to prevent lighting of the lethal fuse.

Electrical Wiring. Electrical wiring is often a source of tragedy—usually in the form of fire or electrocution. Moreover, this potential danger is present in Air Force dental clinics. As is true of most potential hazards, the key to handling the electrical wiring hazard is prevention.

Preventing electrical wiring hazards involves detecting potential trouble areas and having corrections made. You must have frayed wiring replaced and make sure that overloaded circuits are corrected. Have abnormally warm electrical cords and wiring checked for potential hazards.

Burn Hazards. The dental clinic is also a place where burns occur frequently. Most burns are received from bunsen burners, alcohol torches, hot equipment, and hot instruments. Most of these burns can be prevented by using commonsense. For example, shut off bunsen burners and snuff out alcohol torch flames after each use. In regard to hot equipment items (such as sterilizers), form a habit of assuming that they are hot and react accordingly. Finally, make sure that all hot instruments are either left in the sterilizer until they cool, or dip them in a cold disinfectant solution for cooling before you attempt to handle them.

Slippery Floors. Another common safety hazard in dental clinics is a slippery floor. This condition exists during floor-cleaning operations and sometimes following waxing operations. As a warning against this hazard, post signs during cleaning operations (they may read , "Wet Floors") and use a skid-resistant wax. Always be safety-conscious when you are near a slippery floor.

Adverse Personal Behavior. Another potential hazard in the dental clinic results from individual actions and attitudes. For example, horseplay and a lackadaisical attitude toward safety can lead to unwarranted safety violations. To eliminate this type of undesirable behavior, adopt a professional attitude and practice being safety conscious at all times. The practice of safety in the dental clinic adds up to preventing injuries and possibly saving life (maybe your own).

Exercises (079):

Match each of the statements relating to safety precautions in column B with the factor associated with that safety precaution in column A by inserting the appropriate letter from column B in the blank provided in column A.

Column A

_ 1. Oxygen used for dental emergencies.
_ 2. Natural or propane gas used for fuel.
_ 3. Electrical wiring.
_ 4. Burn hazards.
_ 5. Slippery floors.
_ 6. Adverse personal behavior.

Column B

a. Replace frayed wiring, correct overloaded circuits, and check abnormally warm cords and wiring.
b. Shut bunsen burners off and extinguish alcohol torch flames after each use.
c. Report smell that indicates even a small leak and establish fresh air ventilation.
d. Avoid handling instruments too quickly after they have been left in sterilizer.
e. Careless or thoughtless lighting of a cigarette in a room where leakage exists.
f. Store tanks in upright position; avoid handling in a manner that will produce sparks.
g. Use a skid-resistant wax and post signs during cleaning operations.
h. Avoid horseplay and lackadaisical safety attitudes.
i. Adopt a professional attitude toward individual actions.

5-3. Housekeeping Duties

As a chairside dental assistant, you have a continuing responsibility to maintain a clean work area. Failure to do so can cause patients to become infected by micro-organisms (bacteria) which flourish in a dirty environment. Your job includes preventing these harmful microbes from infecting dental patients. One preventive measure is realized through good housekeeping. That is, the equipment and facility must be kept in a sanitary condition at all times. Naturally, this means that you must clean the equipment and facility at prescribed intervals. Additionally, many dental patients are known to prejudge the quality of a dental service by what they see. A soiled uniform, a dusty cabinet top, dirty floors, and a dirty bathroom can give patients an adverse impression of a clinic.

080. Given specific statements about housekeeping procedures applicable to dental equipment, identify which are true and which are false.

Equipment Cleaning. The big problem behind improperly cleaned equipment is not "how to clean it" as much as it is failure to carry out the cleaning responsibility. All too often, the dental assistant falls into the "seeing is believing" group. That is, if the equipment looks clean, he believes that it is clean. Of course, we know that this is not always true, since micro-organisms are invisible to the naked eye. Therefore, the key to good housekeeping regarding dental equipment is to form a habit of cleaning at prescribed intervals and to accept cleanliness as an absolute must in the dental clinic.

Mostly, the cleaning of dental equipment involves cleaning chrome-plated, painted, stainless-steel, and upholstery surfaces. As a general rule, wipe the chrome-plated, painted, and stainless-steel surfaces daily. Occasionally (at least twice weekly), wash these same surfaces with a damp cloth and mild soap. Further, apply a quality automobile paste wax to chrome-plated and painted surfaces, and apply metal polish to stainless-steel surfaces monthly. To clean upholstery surfaces, use lukewarm water and mild soap. Apply only a thin layer of suds to the surface with a sponge. Then, use a cloth dampened with clear water to remove the suds. To finish the job, dry the surface with a soft cloth. Before attempting to remove stains or deposits from any equipment surface, consult the applicable service manual.

Exercises (080):

Enter a T or an F in the blank provided with each of the following statements to indicate whether the statement is true or false.

_ 1. The problem of improperly cleaned equipment is not so much the problem of "how to clean it" as it is failure to carry out cleaning responsibilities.
_ 2. The key to good dental equipment housekeeping is to make a habit of cleaning at prescribed intervals and to accept dental clinic cleanliness as an absolute must.
_ 3. The cleaning of dental equipment involves only the cleaning and waxing of chrome and stainless-steel surfaces.
_ 4. Metal polish is applied to stainless-steel surfaces monthly.
_ 5. To clean upholstery surfaces, apply a quality automobile paste wax, then wash with a damp cloth and mild soap.

081. Supply important information relating to housekeeping practices involved with facility cleaning by answering a series of key questions.

Facility Cleaning. The two goals in cleaning a dental facility are to keep dirt and filth at the lowest possible level and to keep the facility in a presentable condition. For the most part, these two requirements are met simultaneously. That is, when the facility is clean, it is usually presentable, and vice versa. Cleaning a dental facility involves cleaning its floors, walls, windows, furniture, plumbing fixtures, and light fixtures.

Floors. Various floor coverings are used in health care facilities. Among the more widely used ones are concrete, terrazzo, ceramic tile, asphalt and asbestos-vinyl tile, and carpeting. Most Air Force dental facilities have a combination of carpeting, asphalt or asbestos-vinyl tile, ceramic tile, and sometimes concrete as floor surfaces. Normally, all of these floors require daily attention.

Carpeting is usually maintained by vacuuming and spot removal. You should vacuum all carpeting in the dental clinic at the end of each duty day. This daily action is necessary to remove dust and micro-organisms. Try to remove unsightly spots by shampooing. If shampooing fails to remove a spot, consult with your NCOIC before using solvents.

Asphalt and asbestos-vinyl tile require sweeping, scrubbing, mopping, waxing, and buffing. The idea in maintaining this type of floor is to keep it polished and looking clean. To meet this standard, you must sweep, damp mop, and buff these floors at least daily. Also, this standard requires you to scrub floors coated with water emulsion wax at least weekly. Scrubbing is necessary to remove the soiled old wax and scuff marks before you add new wax. Resin-emulsion wax is more resistant to soil and stains than the water-emulsion type. For this reason, you may wait for as long as 3 weeks or more before floors coated with resin-emulsion wax need scrubbing and rewaxing. Do not use waxes containing inflammable solvents without first getting approval from the installation engineer.

Walls. Most walls in Air Force dental clinics are either painted, tiled, or covered with wood paneling. All of these surfaces collect dust and must be cleaned periodically. The exact interim between cleanings is determined by local conditions. To clean painted and wood-paneled walls, apply a mild soap solution sparingly and follow up by rinsing with clear water. Clean acoustical tile walls by dusting them with a dry cloth or by vacuuming. Don't forget to include doors, baseboards, and framework as you clean the walls.

Windows. Another significant requirement in cleaning a dental facility is window cleaning. Most Air Force dental facilities have a large number of windows, which soon become "eyesores" because of neglect. A dental patient will frequently associate the cleanliness of a dental clinic with the cleanliness of the windows. Therefore, we must do our utmost to keep all clinic areas clean in order to eliminate distrust and uneasiness on the part of patients.

Whenever possible, use clean water as a cleaning agent on window surfaces. Clean water is removed easier and streaks less than most commercial window cleaners. If water will not sufficiently clean a window, you may use a stocklisted window cleaner or add a small amount of ammonia to water. Apply these agents with a soft, clean cloth and dry the windows with a clean, dry, lintfree cloth. You can further diminish the prominence of streaks by moving the drying cloth horizontally across the window.

Plumbing fixtures. The primary requirements in cleaning plumbing fixtures involve two different types of surfaces—chrome-plated and porcelain. Normally, chrome-plated fixtures can be cleaned with a damp cloth and then polished with a soft, dry cloth. If you must clean corroded, chrome-plated fixtures, use a soft cloth and apply stocklisted metal polish. Then use another soft, dry cloth to shine the fixture. Porcelain surfaces may be cleaned with scouring powder or porcelain cleaner liquid. Normally, scouring powder is the choice for cleaning porcelain sinks, while porcelain cleaner liquid is used for cleaning other porcelain bathroom fixtures. Be sure you read the label concerning the proper use of porcelain cleaner liquid, since it is caustic to human tissues. If, for no other reason, clean plumbing fixtures daily to maintain their characteristic luster.

Lighting fixtures. Some Air Force dental clinics have light fixtures suspended from the ceiling. Because of their structure and location, such fixtures become dust collectors and must be cleaned periodically (about once each quarter). Before cleaning these fixtures, make sure that the electrical switch is in the OFF position. Then dismantle the fixture as much as you can without using tools. The dismantling normally provides access to all

26

areas of the fixture. Next, clean the fixture with a damp cloth. CAUTION: Be sure that you do not apply the damp cloth to hot light bulbs or lamps as this might cause the bulb or lamp to shatter. To reassemble a fixture, reverse the step-by-step procedure you used to dismantle it.

Furnishings. The furnishings in Air Force dental clinics include pictures, window shades, drapes, tables, chairs, couches, and desks. As a general rule, you should dust these items with a soft, dry cloth daily. However, if dusting does not remove the soil and stain, you may need to use mild soap and water or shampoo. Milk soap and water are appropriate for cleaning painted and plastic surfaces. Use shampoo to clean fabric-type upholstery found on some chairs and couches. Have drapes drycleaned. By keeping these furnishings clean, you help the dental service put its best foot forward. This is especially true in connection with furnishings, since most of them are located in the waiting room for all to see.

Exercises (081):

1. What two goals are usually met simultaneously in cleaning a dental facility?

2. How often do the variety of floor coverings used in most Air Force dental facilities normally require attention?

3. State briefly how carpeting is usually maintained.

4. How often should you scrub and rewax:
   a. Floors coated with water emulsion wax?

   b. Floors coated with resin-emulsion wax?

5. What determines the exact interim between cleanings of Air Force dental clinic walls?

6. Although clean water is preferred as a cleaning agent on window surfaces, name two alternate ways to clean windows when water will not do the job.

7. How often should plumbing fixtures be cleaned so they will maintain their characteristic luster?

8. What precautionary step should be taken before the periodic cleaning of dental clinic lighting fixtures by the dismantling process?

9. As a general rule, how and when are dental clinic furnishings dusted?

10. How are drapes cleaned?

082. Complete blanks in statements concerning housekeeping procedures required in areas outside the dental clinic.

Outside Areas. Among the outside dental clinic items that need attention are the building exterior, lawn, and parking lot. To maintain the building exterior in a presentable condition, you should keep the windows and entrance ways clean and keep cobwebs removed from the exterior. Maintaining the lawn means that you should keep the grass and hedges neatly trimmed, the walks and steps free of debris, and all litter picked up (particularly around trash receptacles). Normally, parking lot maintenance means keeping the lot free of litter.

Exercises (082):

Fill in the blanks in each of the following statements with the most appropriate word.

1. Among the ______ dental clinic items that need attention are the building exterior, lawn, and ________ .

2. Keep the windows and entrance ways ______ and keep ______ removed from the building exterior.

35

3. Maintaining the lawn, parking lot, and area around trash receptacles includes picking up ________ .

5-4. Maintenance of Dental Treatment Room Equipment

Two men bought identical houses next door to each other. At the end of a year, each sold his house and moved from the city. One man received $1000 more than the other for his house. The difference in the prices received was due to the maintenance performed by each man on his house. The man who received the most had routinely made minor repairs and adjustments. The other had made no repairs or adjustments of any kind. From this example, you should be able to see the importance of performing necessary maintenance. This section discusses the principles of maintenance of dental treatment room equipment and some specific maintenance functions that you should perform.

083. Given statements concerning specific types of maintenance in one list, match each with the type of maintenance to which it most closely relates in another list.

Types or Kinds of Maintenance. Overall, the maintenance of medical and dental equipment is the responsibility of the medical organization that uses it. To make this responsibility easier to apply, these four types of maintenance have been established: preventive maintenance, organizational maintenance, field maintenance, and area maintenance.

Preventive maintenance. Preventive maintenance is the care and servicing of equipment for the purpose of retaining it in a serviceable condition. This includes proper operation and use, systematic inspection, detection, and correction of incipient failures either before they occur or before they develop into major defects. Preventive maintenance is a joint responsibility of the medical equipment repairman and the operator or user of the equipment. This level of maintenance is an extremely important function of any maintenance program. Proper care and use by the operator and scheduled preventive maintenance by maintenance personnel will insure maximum reliability, prolong the useful life of the item, and reduce the time that the equipment is inoperative. Preventive maintenance includes the following routine maintenance actions relating to the proper operation and use of equipment: maintenance of oil levels, simple lubrication, daily inspections, cleaning, and minor exterior repairs. All of these maintenance actions are the responsibility of you, the apprentice dental specialist.

Organizational maintenance. Organizational maintenance is a definitive form of maintenance that is the responsibility of, and that is performed by, a using organization on its assigned equipment. It consists of inspecting, servicing, lubricating, adjusting, repairing, modifying, and replacing parts or assemblies and subassemblies. Organizational maintenance requires the services of qualified maintenance personnel and the use of tools and test equipment not available to the operator of the equipment. It should be performed only by, or under the direct supervision of, a fully qualified medical equipment repairman.

Field maintenance. Field maintenance is the maintenance performed by a designated maintenance activity in support of using organizations. This maintenance is normally limited to major repairs, inspections, and replacement of parts or assemblies. For Air Force medical facilities, field maintenance is limited to the services of precision measurement equipment laboratories (PMELs) and the Atlanta Army Depot.

Area maintenance. Area maintenance is that maintenance performed by a medical equipment repair center (MERC) functioning on a geographic basis. MERCs may be used to provide primary organizational or field maintenance support, or to augment existing organizational maintenance capabilities.

Exercises (083):

Match each statement in column B regarding the scope of responsibility with the type or kind of maintenance to which it most closely relates as listed in column A by inserting the appropriate letter in column B in the appropriate blank in column A.

Column A	*Column B*
_ 1. Preventive maintenance.	a. Performed by a using organization on its assigned equipment; consists of inspecting, servicing, lubricating, adjusting, repairing, modifying, and replacing parts or assemblies and subassemblies. However, it requires the services of qualified maintenance personnel (performed by, or directly supervised by, qualified medical
_ 2. Organizational maintenance.	
_ 3. Field maintenance.	
_ 4. Area maintenance.	

Column B

equipment repairmen); it also requires use of tools and test equipment not available to the operator of the equipment.

b. The care and servicing of equipment to retain it in a serviceable condition; is the joint responsibility of the medical equipment repairman and the operator or user of the equipment; includes routine maintenance items such as maintenance of oil levels, simple lubrication, and minor exterior repairs.

c. Those major repairs, etc., performed only by PMELs and the Atlanta Army Depot designated to support using organizations (Air Force medical facilities).

d. That maintenance performed by a medical equipment repair center functioning on a geographic basis.

e. May be used to provide primary organizational or field maintenance support, or to augment existing organizational maintenance capabilities.

084. Give significant details about user-maintenance procedures required for the dental operating unit by answering a series of key questions.

Dental Operating Unit. Many dental operating units are in use in the Air Force Dental Service. They are only slightly standardized since they are of different design, shape, and manufacture. This equipment is necessary so that the dentist will be able to complete a wide variety of dental treatment procedures. Most dental operating units are equipped with water, air, gas, and electrical systems. For the reason given earlier, the maintenance instructions given here are necessarily general in nature. Specific maintenance procedures are available in manuals prepared by the equipment manufacturers. If these manuals aren't available in your clinic, ask your NCOIC to obtain the necessary copies.

Probably the best approach toward preventive maintenance of dental equipment is to begin each duty day by making a visual inspection, followed by an operational check. During the inspection, first look for obvious problem areas, such as frayed electrical wiring, missing screws, oil leaks, water leaks, and the like. Then make an operational check of each of the four systems mentioned in the above paragraph. For example, try working the water syringe and saliva ejector to check the water system. Try operating air-driven handpieces and air syringes to check the air system. Try lighting the gas burner to check the gas system. (Be sure to turn the burner off after the check.) Activate the engine to check out the electrical system.

Water system. A malfunctioning water system affects the operation of the water syringe, cuspidor, saliva ejector, cup filler, and handpiece water spray hookup. If any of the above items fail to work, first make sure that the necessary valves and switches have been activated. Then turn the main water valve off and check the associated filters and screens. If you have not solved the problem at this point, be sure to read the manufacturer's instructions before proceeding further. More often than not, water leaks are a result of loose connections or defective washers and valves. When necessary, simply tighten the connection or have medical equipment repair personnel replace the defective part.

Air system. With the advent of air-driven handpieces, dental unit air systems have become more elaborate and complex. On some dental units, air is used to operate up to three air-driven handpieces, an air syringe, a spray syringe, and the handpiece lubricating system. In addition, the air supplied must be as clean as possible in order to prevent contaminating dental patients and to protect expensive handpieces. One problem is that of having excessive moisture in the air system. Moisture-laden air passing through precision-engineered handpieces tends to ruin them in rapid order. To eliminate the moisture problem, you must drain the air tank and purge the air lines daily. Another problem often encountered in the air system is incorrect air pressure at critical points. Most air-driven handpieces operate on air pressure falling within the 20- to 60-psi range, with a specific pressure recommended for each handpiece. By following instructions furnished by the manufacturer, you can make fairly simple adjustments to meet the air pressure requirements. Either correct all air leaks or have them corrected as soon as possible.

29

Gas system. Usually, the dental unit gas system is used less than the other systems. However, all systems must be "go" at all times within reason. The most critical aspect of the gas system is the hazard it presents. Be sure to take precautionary action when you first smell escaping gas—then corrective action! Replace or have defective gas valves replaced without delay. Also, make sure that leaks in other areas of the system are promptly repaired by the medical equipment repair section or by civil engineers, as applicable.

Electrical system. Probably the most complex system on a dental operating unit is the electrical system. In most cases, other systems are also affected by the electrical system. Unless you have had special training and have special electrical test equipment, electrical system problems should be turned over to the medical equipment repairman. Among the items affected by a dental unit electrical system are the dental engines, reservoir heaters (water and air), pulp testers, cautery devices, and solenoids (electrically operated switches) which help control other dental unit systems.

Dental engine assembly. Many dental operating units are equipped with one of several small, electric-powered engines. By way of a belt hookup, these engines operate conventional handpieces. Because of the engine, the belt, and a series of guide pulleys for the belt, this assembly can be a source of maintenance ills. However, by completing daily inspections and scheduled maintenance procedures, the dental engine assembly is seldom a cause for alarm.

The engine itself should be lubricated once monthly, on the average. A good grade of lightweight engine oil is the lubricant of choice. On some of the newer units, you may need to first remove engine covers to gain access to the oil holes. Normally, you will find oil holes at the top and bottom of the engine shaft. Place two to three drops in each oil hole monthly. Then replace the engine cover. (See fig. 5-1.)

You should replace the engine belt when you first notice signs of fraying. To do this, remove the engine arm covers (if present), loosen the belt tension by turning the engine arm adjusting screw counterclockwise, and remove the old belt. Then place the new belt in position on all pulleys and tighten the belt adjustment screw. (Turn if clockwise.) After the belt slack has been removed, activate the engine. While it is running, adjust the engine arm adjustment screw both clockwise and counterclockwise until the highest pitch of sound is heard. At the highest pitch point, the belt is properly adjusted. (It is preferable for the belt to be adjusted a little too tight than too loose.)

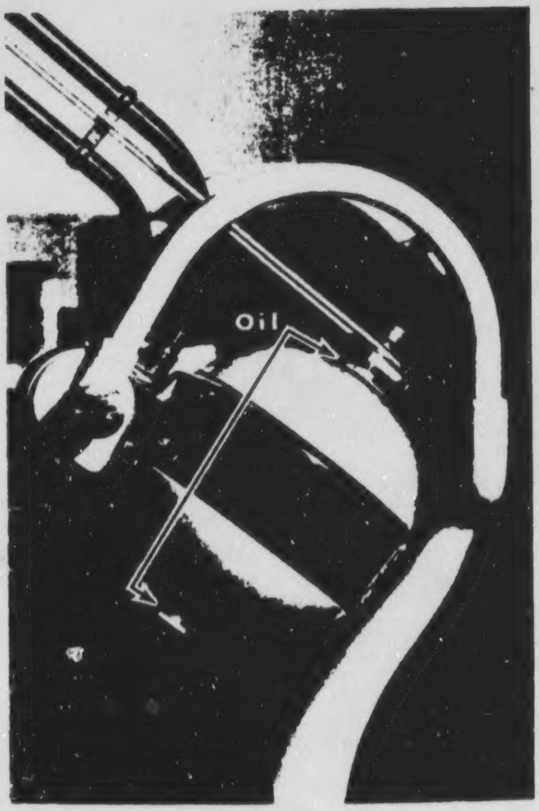


Figure 5-1. The dental engine.

Lubricate the pulleys on the engine arm about every 3 months, making sure that you don't overlubricate. Excess oil on the pulleys is a dust collector. In general, remove and clean the pulleys and lightly relubricate the bearing or pulley shaft area with a lightweight engine oil. Then reassemble the pulleys, making sure the retaining screws are tight. The adjusting arm mechanism seldom needs lubrication. When it does, use a little handpiece grease.

Syringes. Dental operating units usually have an air syringe and a water syringe, and many of the newer models are equipped with a third, combination syringe (air, water, and spray). If you have problems with the inner workings of any of these syringes, it is best to have a qualified medical equipment repairman repair or replace them. But if no qualified help is available, you can perform the necessary maintenance yourself by following step-by-step procedures available from the manufacturer. Problems in conjunction with binding syringe hoses are usually solved easily. First, remove the back unit panel. Then locate the offending hose. In most cases, simply realigning the binding hose or lubricating the guide slides is all that is necessary. Lubricate lightly with lightweight machine oil unless nylon or plastic surfaces are involved. If they are, use a silicone spray (dry) lubricant.

Saliva ejector. Neglected salvia ejectors can become a perpetual problem area. For this reason, daily preventive maintenance is of prime importance. The maintenance procedure consists of cleaning the screen and running a cup of water through the system. Do this at the end of the day and more often if necessary.

Cuspidor. As is true of the saliva ejector, the neglected cuspidor may also become a perpetual problem. It too requires daily maintenance. This maintenance consists of cleaning the entire bowl and the gold or amalgam trap. Failure to do so causes corrosion and may eventually clog the entire drainage system.

Again, you should be aware of your limitations regarding maintenance of dental equipment. To be sure, you will be faced with maintenance problems for which there are no answers. In most of these situations, you can solve the problem by using all available resources—including experienced coworkers, medical equipment repairmen, manufacturer's instructions, and commonsense. In some cases, you may need to solicit factory assistance.

Exercises (084):

1. To what degree are dental operating units standardized?

2. What is the best source of specific maintenance procedures concerning dental operating units?

3. Summarize the preventive maintenance of dental operating units that is recommended at the beginning of each duty day.

4. What are two causes of water leaks that you or medical equipment repair personnel can correct?

5. Name two problems often encountered with the air system of the dental operating unit, and state how each may be corrected.

6. Because of the complexity of the electrical system and its interaction with other systems, what should an operator usually do about electrical system problems?

7. When should you replace the engine belt of the engine assembly of the dental operating unit?

8. Describe the sound that tells when the engine arm adjustment screw has been positioned so that an operating new belt is properly adjusted.

9. What lubricant is used for nylon or plastic surfaces of guide slides when there are problems in conjunction with binding syringe hoses of dental operating units?

10. What is a likely result of neglecting to clean the entire bowl and the gold or amalgam trap of the dental operating unit as a part of daily maintenance?

11. What preventive maintenance is made daily, or oftener if necessary, that concerns the saliva ejector of dental operating units?

085. Complete the blanks in a series of statements concerning the user-maintenance procedures required for dental operating chairs.

Dental Operating Chair. As is true of dental operating units, the US Air Force Dental Service has a number of different makes and models of operating chairs. All of them have

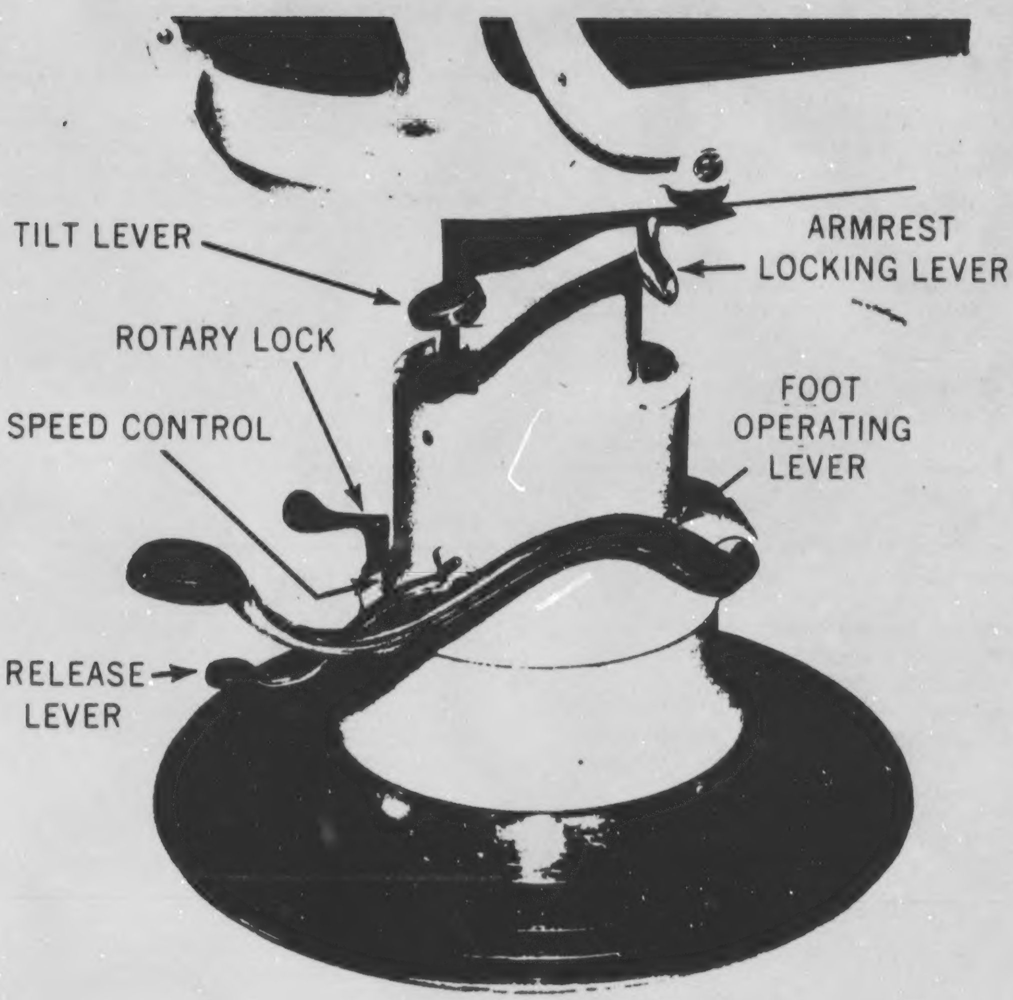


Figure 5-2. The dental chair.

certain things in common. We are able to raise or lower the operating chair manually or electrically. The back, headrest, armrests, and footrest may be adjustable. Before attempting any maintenance of the dental chair, first determine any problem you have with it. This can be done by performing a simultaneous inspection and operational check.

There are certain things that you should ascertain when inspecting the chair. (See fig. 5-2.) The exterior surface must be clean and well-polished. There should be no oil leaks. You should look for broken or missing parts. The upholstery should be in good repair, with no tears or other damage. For the operational check, we shall consider the chair in its two basic parts—the chair pump and the chair frame.

In the manually operated chair pump, the foot-operating lever should move freely and smoothly and should return to the UP position when released. The chair should remain at any desired height. Each stroke of the operating lever should cause the chair to rise. When the release lever is pushed, the chair should lower evenly and smoothly. If the chair has a speed control, it should vary the speed of descent. When the chair is raised to its maximum height, there should be no wobble or play.

All adjustments of the chair frame should be included in the operational check. The headrest, backrest, armrest, and footrest should move freely and smoothly and lock in any position. The chair-tilt lever should allow the chair to be tilted and locked firmly in any position. The base of the chair is not normally moved for each patient. There are, however, chairs equipped with a track that allows forward and backward movement of the chair base.

Hydraulic system. The dental operating chair hydraulic system is activated by either an electric motor or a foot-operated lever. For the most part, this system is seldom a source of trouble. With proper preventive maintenance and absence of abuse, the hydraulic system will function well for a number of years.

However, like many other things, some hydraulic systems turn out to be "lemons." When this is the case, the associated problems may range from abnormal oil leaks to broken chairs. In such cases, you should call in the medical equipment repairman and perhaps a factory representative for any necessary assistance.

Some of the things that you may be directly concerned with are the reservoir fluid level, air or oil leaks, plus the travel rate of hydraulically controlled chair parts. As a general rule, you should not attempt to repair or replace the inner workings of the hydraulic system. This is a job for a qualified medical equipment repairman.

The exact way to add oil to a dental chair hydraulic system varies with the different models and different manufacturers. Thus, you must consult the manufacturer's instructions for the correct fluid level and procedures for adding needed oil. Most dental chair hydraulic systems use S.A.E. 20-weight motor oil for the hydraulic fluid.

In order for a hydraulic system to work properly, the oil in it must be free from air. Oil leaks eventually permit air to mix with the oil and cause sluggish operation. Extremely low levels of oil (also a broken chain) may prevent the system from working altogether. To expel air from the system, you must first lower the chair to its lowest position. Then remove the seat cushion to gain access to the air vent screw. (See the manufacturer's instructions.) Next, loosen the screw (turn it counterclockwise) about one turn and operate the foot lever or activate the motor for a few seconds. While still working the foot lever or still running the motor, tighten the screw.

At times, the rate of travel for the hydraulically controlled parts of a chair may be too fast or too slow. On older chairs, only the up and down movements are hydraulically controlled. The rate of travel on these older chairs can be adjusted by turning the adjusting screw (see fig. 5-2) clockwise for slower movements and counterclockwise for faster movements. On newer electric-powered chairs, not only the up and down movements are hydraulically controlled but the forward and backward tilt of the backrest and entire seat are also hydraulically controlled. To gain access to these adjusting screws, read the manufacturer's instructions.

Other chair adjustment devices. Dental chair adjusting devices besides those already discussed are mostly the friction-control type. That is, a type of lever is loosened (usually turned counterclockwise), the necessary adjustments made, and then the lever is tightened again. Thus, the adjusted position is maintained by friction. Little lubrication is needed for these friction-control devices. At the most, apply only one drop of lightweight oil on the device every 6 months. Some of the older headrest adjustment devices have an additional adjustment to control the degree of tightness when the lever is in the tightened position.

Exercises (085):

Complete the following statements by inserting the most appropriate word in each blank.

1. Although the Air Force Dental Service has many makes and models of operating chairs, each chair can be raised or ______ manually or ________ .

2. When performing the inspection part of an inspection and operational check of dental operating chairs, ascertain that the __________ surface is clean and well polished; there should be no _________ leaks, or broken or missing parts; and the upholstery should be in ________ repair, with no ________ or other ________ .

3. In the manually operated chair pump, the foot operating lever should move freely and smoothly and should return to the _________ position when released; each stroke of the operating lever should cause the chair to ________ ; when raised to maximum height, there should be no ________ or play.

4. The dental operating chair's hydraulic system is activated by either an ________ motor or a ___________ motor or a ________ -operated lever.

5. As a general rule, do *not* attempt to repair or replace the ________ workings of the hydraulic system, since this is a job for a __________ medical equipment repairman.

6. Most dental chair hydraulic systems use S.A.E. 20-weight ________ oil for the hydraulic fluid, although you should consult the manufacturer's ________ for specific instructions about adding oil.

7. The oil in the dental chair hydraulic system must be free from ________ in order for the system to work properly.

8. To expel air from a dental chair's hydraulic system, you must first ________ the chair to its ________ position.

9. A subsequent step in freeing the system from air is to ________ the air vent screw by turning it ________ about one turn before operating the foot lever or motor.

10. The rate of travel of older hydraulically controlled chairs can be adjusted by turning the adjusting screw ________ for slower movements and ________ for faster movements.

11. Friction-control type devices used in adjusting dental chairs are lubricated by applying one ________ of lightweight oil on the device every 6 ________ .

086. Given a series of statements about dental handpieces, indicate which statement is true and which is false.

Handpieces. What is a handpiece? What is its purpose? A dental handpiece is a precision-built mechanical device designed to rotate the burs, stones, wheels, and discs used in dental treatment. Handpieces may be classified in accordance with their rpm (revolutions per minute). Conventional-speed handpieces rotate at speeds up to 12,000 rpm. High-speed handpieces attain speeds of rotation up to 100,000 rpm. Ultra-speed handpieces are air-driven and rotate at speeds up to 300,000 rpm. Handpieces are also classified as air- or belt-driven and straight or contra-angle. Constant preventive attention is an absolute necessity in the care and maintenance of handpieces. If they are not properly cleaned and lubricated, abrasives—such as finely ground tooth, metal, and other particles—will cause excessive wear. The result of this wear is undue vibration.

Exercises (086):

Write T in each blank beside each statement below that is true and F beside each statement that is false.

_ 1. Dental handpieces are precision-built mechanical devices designed to rotate the burs, stones, wheels, and discs used in dental treatment.

_ 2. High-speed handpieces are air-driven and rotate at speeds up to 12,000 revolutions per minute.

_ 3. Ultra-speed handpieces are air-driven handpieces that operate at speeds up to 300,000 rpm.

087. Cite specific maintenance procedures that apply to conventional-speed, straight handpieces.

Conventional-speed handpieces. The first conventional-speed handpiece we shall discuss is the straight handpiece. You must use meticulous care when performing maintenance on this handpiece. It is to be cleaned and lubricated after every 10 hours of general use or whenever it overheats (whichever comes first). You must completely disassemble the handpiece before you can clean and lubricate it properly. Complete the disassembly, cleaning, lubrication, and reassembly as follows.

The disassembly is necessary so that you may clean and lubricate the inaccessible parts. Figure 5-3 is an illustration of this handpiece; refer to it often during the following discussion. Disassemble the handpiece by first unscrewing the tightening rod and removing it, along with the collet nut. Next, remove the drive pulley. Unscrew the sheath nut, and remove the sheath and spindle. Remove the spindle from the sheath. Finally, remove the bur chuck and chuck lock plunger from the spindle. This is done by inserting the chuck removal rod into the nose of the spindle and forcing the bur chuck and chuck lock plunger to the rear of the spindle.

Thorough cleaning to remove gummy oil, saliva, and tooth debris is the next procedure. As you disassemble the handpiece, place the small parts in a container of handpiece cleaner. Shake the container vigorously to thoroughly flush each part. Next, insert a handpiece brush into the sheath. After immersing the small end of the sheath in handpiece cleaner, use an up-and-down motion to clean the inside of the sheath. Follow the same procedure when cleaning the spindle. After all parts have been cleaned, dry them with paper towels and pipe cleaners. Never use cotton-tipped applicators to clean a handpiece. They leave small strands of cotton fibers on the inner surfaces of the handpiece.

After you have thoroughly cleaned the handpiece, it is ready for lubrication and

34

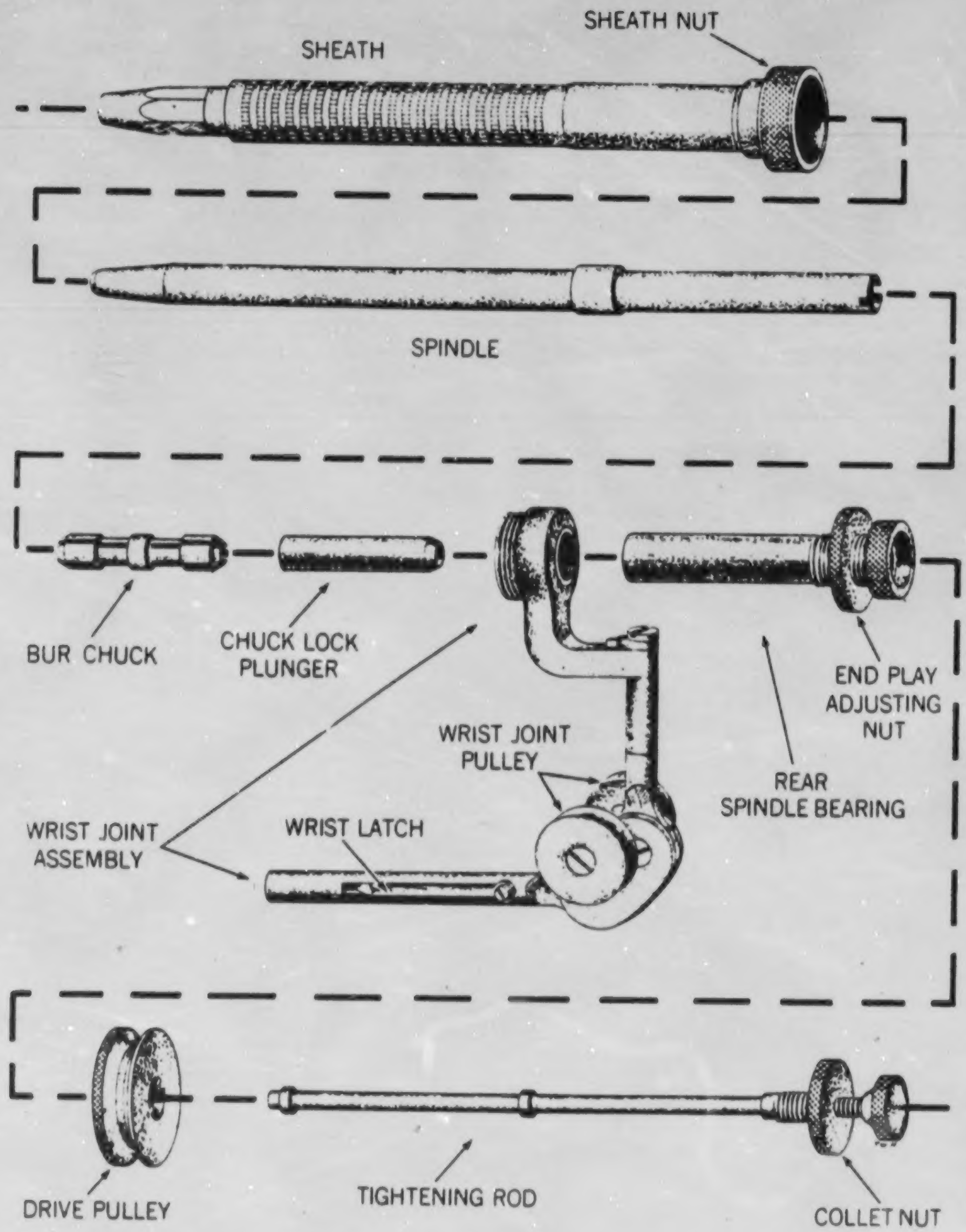

SHEATH NUT
SHEATH
SPINDLE
BUR CHUCK
CHUCK LOCK PLUNGER
END PLAY ADJUSTING NUT
WRIST JOINT PULLEY
REAR SPINDLE BEARING
WRIST JOINT ASSEMBLY
WRIST LATCH
DRIVE PULLEY
TIGHTENING ROD
COLLET NUT

Figure 5-3. Conventional-speed, belt-driven, straight handpiece.

43

reassembly. The procedure for reassembly is in reverse order of disassembly. The lubrication will be explained in this order so that you may reassemble the handpiece as you lubricate it. First, coat the bur chuck lightly with a handpiece lubricant and replace it in the spindle from the rear. Follow this by lubricating the chuck lock plunger and placing it in the spindle. Next, coat the outer rear section of the spindle and insert it into the rear section bearing. Lubricate the nose section of the spindle where it comes in contact with the sheath. Lightly lubricate the outside of the rear section bearing. Insert the drive pulley, insuring that it engages the slots in the spindle. Lastly, lightly lubricate the threads of the tightening rod and screw it into the barrel of the spindle. This completes the assembly and lubrication of the handpiece except for the wrist joint pulley and guard.

Disassemble the wrist joint pulley and guard. Immerse the pulley shaft and hinge body in the cleaner. Wipe off the cleaner and place a light coat of dental engine oil on the pulley shaft and hinges. Reassemble the parts in reverse order, and your handpiece is ready for operation.

Occasionally, an adjustment is necessary to eliminate undesirable end play in the straight handpiece. If proper cleaning and lubrication procedures have been followed, this adjustment is seldom needed because of excessive wear. It is usually required because of loosening of certain parts. To make this adjustment, loosen the tightening rod and turn the collet nut clockwise, using finger pressure until the end play has been removed.

Exercises (087):

1. How often should the conventional-speed, straight handpiece be cleaned and lubricated?

2. State the sequence of the four steps involved in cleaning and lubricating the handpiece's inaccessible parts.

3. Summarize the first and last steps involved in disassembly.

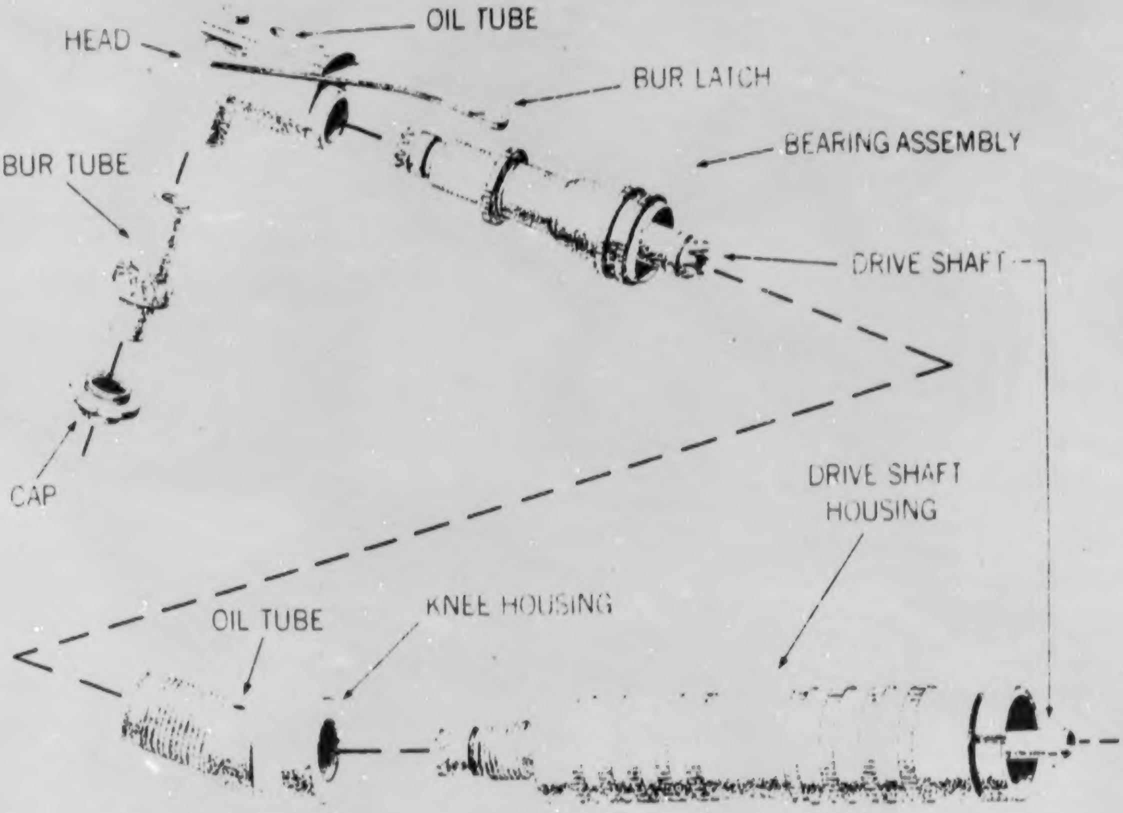


Figure 5-4. Conventional-speed, contra-angle handpiece.

4. After all parts of the disassembled handpiece have been thoroughly cleaned, what takes place next?

5. State briefly how undesirable end play in the straight handpiece is removed.

088. Given a series of statements concerning the maintenance procedures for the conventional-speed, contra-angle handpiece attachment, indicate which are true and which are false.

The next handpiece we shall discuss is the conventional-speed, contra-angle attachment. This handpiece should be lubricated after each 5 hours of use. There are two lubrication points on this attachment. See figure 5-4 for the location of these holes. Using handpiece grease, insert the tip of the grease tube into the hole in the elbow and squeeze until the grease begins to escape at the junction of the tube tip and hole. The other lubrication point is under the bur lock latch. Open this latch and repeat the procedure.

The angle handpiece should be thoroughly cleaned and lubricated after each 10 hours of operation. The handpiece must be disassembled in order to do this. Refer to figure 5-4 during this discussion of the disassembly of the handpiece. Using two pairs of pliers with friction tape-covered jaws, disassemble it in the following order:

1. Remove the cap from the bur tube.
2. Remove the head assembly from the adjoining bearing assembly.
3. Remove the bearing assembly from the knee housing.
4. Remove the knee housing from the drive shaft housing.

Place these parts in a container of handpiece cleaner and flush thoroughly. After they have been cleaned, dry them with paper towels. The handpiece is now ready to be lubricated. Carefully pack grease into the elbow and the head assembly as the component sections are reassembled. The reassembly procedure is the reverse of the disassembly procedure. To prevent marring the plated finish, be careful in your use of tools. It is important that the knurled end of the bearing section and the head be properly aligned to the elbow. Aligning the lubrication holes in the elbow and head will insure proper relationship. Care for the right-angle prophylaxis handpiece in a similar fashion, with one major exception: Be sure to disassemble, clean, relubricate, and reassemble it after each use.

Exercises (088):

Identify each of the following statements as either true (T) or false (F).

_ 1. Lubricate the conventional-speed, contra-angle handpiece attachment after each 5 hours of use.

_ 2. Insert the tip of a tube of handpiece grease into each of the two lubrication points and squeeze until the grease begins to escape.

_ 3. Thoroughly clean and lubricate the angle handpiece after each 10 hours of operation, but do NOT disassemble it while performing this maintenance.

_ 4. As a part of proper maintenance, and after the disassembled parts have been cleaned and dried, they are lubricated and reassembled in the following order: (1) knee housing to drive shaft housing, (2) bearing assembly to knee housing, (3) head assembly to bearing assembly, (4) cap to bur tube.

_ 5. The tools used in disassembly and reassembly are so constructed that you cannot mar the plated finish.

_ 6. Maintenance of the above handpiece and the right-angle prophylaxis handpiece are identical in every respect.

089. Fill in the blanks in statements about the maintenance procedures for high-speed handpieces.

High-speed handpieces. The maintenance of the belt-driven, high-speed, straight handpiece is less complex than that of the slower speed handpiece, but it is just as important. The disassembly of this handpiece involves only the removal of the sheath. After removal, clean the inside and outside of the sheath support. Since you do not disassemble the handpiece completely, clean the chuck by passing a pipe cleaner through the front end of the spindle. After these areas have been cleaned, dry them with a paper towel. Since this handpiece operates at a high speed, use a lightweight engine oil for lubrication. Figure 5-5 illustrates the points to lubricate.

- Place two drops of oil on the drive pulley.
- Place two drops of oil on the sheath support.

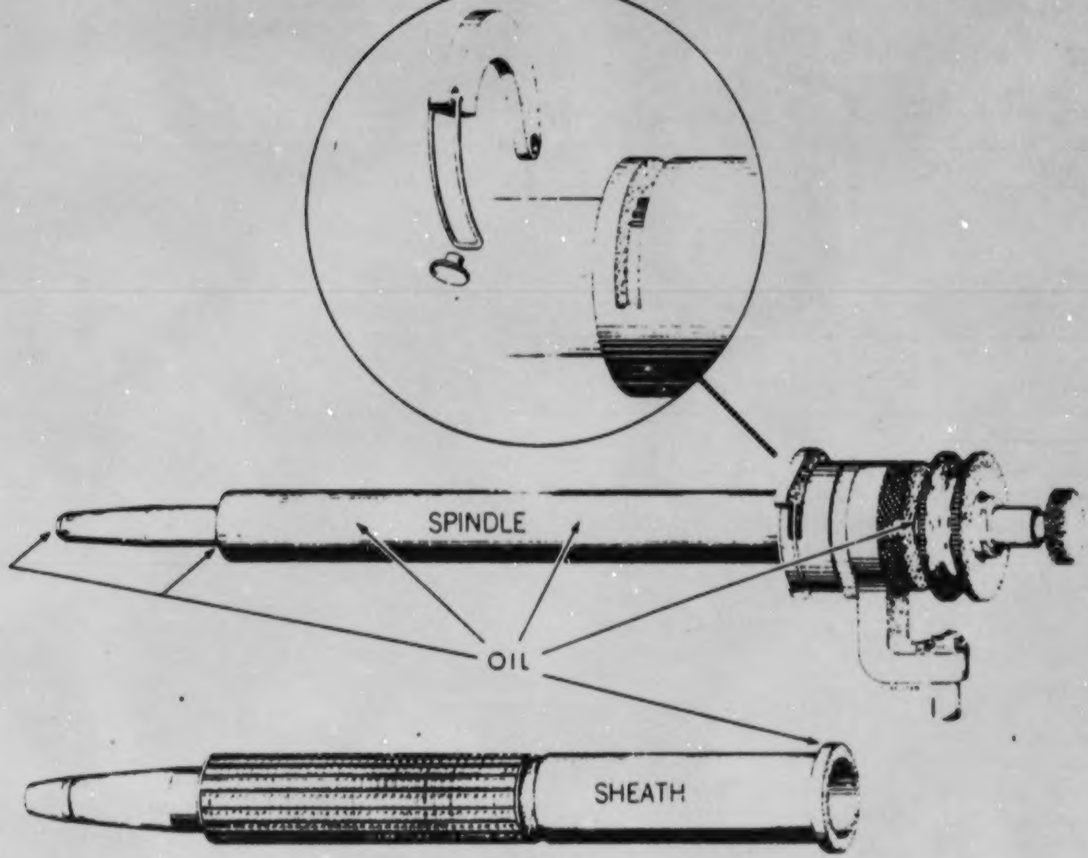


Figure 5-5. High-speed, belt-driven, straight handpiece.

- Place one drop of oil in the end of the spindle to lubricate the chuck.
- Place one drop of oil on the sheath lock.
- Place two drops of oil between the spindle and the sheath support.

Replace the sheath, which was the only part removed for cleaning and lubrication. The wrist joint of this handpiece has sealed ball bearings, which require no maintenance other than placing two drops of oil on the pulley shaft.

The high-speed, contra-angle handpiece attachment is maintained in the following way. Operate the handpiece in the cleaner for 15 seconds in each direction at slow speed. Repeat this procedure in lubricating oil. Do not disassemble this handpiece.

Exercises (089):

Complete the following statements by inserting the most appropriate word in each blank.

1. The maintenance of the ________ -driven, high-speed, straight handpiece is ________ complex than the maintenance of the slower speed handpiece, but it is just as ________________ .

2. The disassembly of this handpiece involves only the removal of the __________ .

3. Clean the ___________ by passing a pipe cleaner through the front end of the _____ .

4. Since this handpiece operates at a high speed, use a ___________ engine oil for lubrication.

5. The wrist joint of this handpiece has ________ ball bearings; therefore, the only maintenance required is to place ________ drops of oil on the pulley shaft.

090. Given a list of air-driven handpiece systems and components, match each with

the most appropriate statement in another list.

Ultra-speed handpieces. In addition to the belt-driven handpieces, there are ultra-speed handpieces that are operated by air pressure. Do not attempt to operate any of the ultra-speed handpieces without first consulting the appropriate manufacturer's instructions. All models of the ultra-speed handpieces work on the same basic principle. The bur is held in the handpiece by either a friction grip chuck or by a chuck that requires manual tightening. These chucks are a part of the bur tube and should be changed in accordance with the manufacturer's instructions. The bur is rotated when air is forced through the air ports into the head of the handpiece and to the air turbine.

Ultra-speed handpieces are operated in part by the air system, in part by the water system, and in part by the electrical system of a dental operating unit. Controls for operating the handpieces are found either in a control cabinet mounted on the dental operating unit or are built into the unit itself.

The *air system* helps to operate several parts of the ultra-speed handpiece. The main function of the air is to rotate the air turbine. In other words, the air system is the main power source for ultra-speed handpieces. On some handpieces, the air system also functions to keep the handpiece cool. Still another function of the air system is that of moving the handpiece lubricant from the lubricant reservoir to the handpiece. But this is not required for all of the ultra-speed handpieces, since you must personally lubricate some of them. Be sure that you read the manufacturer's instructions for the lubrication requirements for each handpiece. Further still, the air system may supply air to the handpiece for blowing chips of tooth structures from cavity preparations. For each of these air system functions, there is a separate air line. Normally, these lines merge at some point on the unit and are connected by a multiple-line, flexible hose to the handpiece. As a precautionary measure, the main air line is equipped with a filter to prevent moisture in the air system from reaching the handpiece bearings. Some units also have a purging valve for eliminating excess moisture. Change these filters as the manufacturer directs.

The *water system* plays a smaller role than the air system on ultra-speed handpieces. The prime function of the water system on these handpieces is to keep the handpiece cool. As mentioned earlier, this cooling requirement may also be performed by the air system. The water system also emits a fine spray mist, which aids in rinsing debris from the operating site.

The *electrical system* function in operating the ultra-speed handpiece is to activate solenoids, which control the other systems. To start the action, the operator activates a foot switch. The switch may be a separate mechanism or it may be built into the dental operating unit. The built-in type may also be used to operate a separate dental engine. Usually, a switch is provided on the foot controller to enable the operator to change from operating the dental engine to the air-drive system, and vice versa.

Proper lubrication of ultra-speed handpieces is of utmost importance and is one of our continuing maintenance problems. The importance of this requirement cannot be overstressed. Most ultra-speed handpieces are lubricated by the air-forced system today. Such a system requires you to check the oil supply frequently to determine whether the correct amount is reaching the handpiece and whether the reservoir level is adequate. To be safe, read and reread the manufacturer's instructions to make sure that you understand the lubricating requirements. Then take the necessary measures immediately. It takes only a few seconds to ruin an ultra-speed handpiece that has improper or insufficient lubrication.

Slow-speed, air-driven handpieces. Some of the newer dental units are now equipped with a slow-speed handpiece powered by the air system. These handpieces are also activated by working the foot controller. Most of these handpieces are lubricated by the air forced system just as the ultra-speed handpieces are. The biggest difference between the slow-speed, air-driven handpieces manufactured by various companies is in the amount of oil required for each type of handpiece. Some of these slow-speed, air-powered handpieces may also require additional lubrication in certain areas, so be sure to read the lubrication instructions.

Exercises (090):

Match each statement in column B with the most applicable system or component in column A by inserting a letter from column B in the appropriate blank in column A.

Column A	*Column B*
_ 1. Ultra-speed handpieces.	a. Each separate air system has one, all of which normally merge at a point on the unit (and are connected to the
_ 2. Bur of ultra-speed handpieces.	
_ 3. Air system of	

Column A

ultra-speed handpieces.
_ 4. Separate air line.
_ 5. Purging valve.
_ 6. Water system of ultra-speed handpieces.
_ 7. Electrical system of ultra-speed handpieces.

Column B

handpiece by a multiple-line, flexible hose).
b. Operated in part by the air system, in part by the water system, and in part by the electrical system of a dental operating unit.
c. Held in handpiece either by a friction grip chuck or a chuck that requires manual tightening; is rotated when air is forced through the air ports into the handpiece's head and on to the air turbine.
d. Main power source for ultra-speed handpieces; sometimes another function is to move the handpiece lubricant from the lubricant reservoir to the handpiece; may also clear cavity of chips.
e. Some units have this component as a means of eliminating excess moisture.
f. Its prime function is to keep the handpiece cool; also aids in rinsing debris.
g. It takes only a few seconds to ruin this type of handpiece if there is improper or insufficient lubrication.

091. Match specific maintenance procedures in one list with the rotary instruments to which they apply in another list.

Rotary Instruments. There are two types of burs—those used with the straight handpieces and those used with the contra-angle handpieces. These burs are made of tungsten carbide and carbon steel. We also use diamond-coated rotary instruments, and we shall discuss their care.

The care of carbon steel burs is simple. If the bur is serviceable after use, it is cleaned, disinfected, and replaced in its holder. To clean the bur, use a stiff wire brush. If the bur is not serviceable, throw it away and replace it with a new one. All types and sizes of burs are always available.

Tungsten carbide burs require little maintenance, since the coolants used with them prevent debris from clogging their grooves. Should they become clogged, clean them with a stiff wire brush. Although tungsten carbide burs last well, they wear out. Discard burs which are worn. Disinfect tungsten carbide burs in 70 percent solution of isopropyl alcohol. Do not place them in benzalkonium chloride. This will cause them to corrode and will shorten their usefulness.

Diamond-coated instruments do not become as clogged at higher speeds as they do at lower speeds. This is because of the light pressure used in cutting at high speeds. If debris does collect in the diamond grit, soak the instrument in soapy water for about 5 minutes and then scrub it with a bristle brush. A rubber-impregnated disk or ink eraser can also be used for cleaning. You may clean with a rubber eraser by applying it against the instrument while it is slowly turned in the handpiece. Old amalgam may be removed by soaking the diamond instrument in pure mercury and then using a brush or an eraser to remove the partly loosened amalgam. Avoid boiling and autoclaving diamond instruments. Doing so causes deterioration of the bonding material.

Exercises (091):

Match each of the maintenance procedures listed in column B with the applicable items listed in column A by inserting a letter from column B in a blank in column A. Some blanks in column A may be matched more than once.

Column A

_ 1. Carbon steel burs.
_ 2. Tungsten carbide burs.
_ 3. Diamond-coated instruments.

Column B

a. Require little maintenance, because coolants prevent debris from clogging their grooves.
b. Clean with stiff wire brush.
c. Normally clean by scrubbing with a bristle brush after soaking it in soapy water for 5 minutes.
d. When necessary, soak this rotary-cutting instrument in pure mercury to partly loosen old amalgam—then remove the loosened amalgam with a brush or an eraser.

092. State which task connected with maintaining dental lights is performed most often, where the most common type of dental light mounts, and a general rule for lubricating the joints of movable parts of dental operating lights.

Dental Operating Lights. Most of the maintenance required for dental lights consists of changing burned out bulbs. Of the two types of lights, the most common one mounts onto the dental operating unit, and the other one mounts on the ceiling. Some of the newer types are equipped with bulbs which require special handling. Read the required literature before you attempt to change a bulb. When changing any light bulb, you should use a *dry* towel to help prevent injury, since the bulb could shatter. The only lubrication required is rather infrequent and in minute amounts. In general, this lubrication (with lightweight machine oil) is required about every 6 months for the joints of the movable parts of the operating lights.

Exercises (092):

1. What task connected with maintaining dental lights is performed most often?

2. Where does the most common type of dental light mount?

3. What should you use when changing a light bulb?

4. Give a general rule for lubricating the joints of movable parts of dental operating lights.

093. Given a series of statements about the user-maintenance required for dental instrument cabinets, indicate which are true and which are false.

Dental Instrument Cabinets. There are two basic types of dental instrument cabinets. One type (the older) has 24 drawers, equally divided into two vertical rows. The other type has from 1 to 12 drawers. These newer (modular) cabinets may be mobile or wall-mounted. Normally, the wall-mounted modular cabinets consist of one to several differing cabinets arranged in a functional sequence with a single, solid cabinet top.

The maintenance for both types is the same, except for the two areas we shall mention. The glass tray inserts, used in the drawers of the cabinets for instrument storage, must be washed frequently. Protect these inserts from breakage by placing a foam rubber strip between them and the back of the drawers. Dust the exterior surface of the cabinets daily and wipe the top with a 70-percent solution of isopropyl alcohol as part of the cleanup between patients. Clean and wax the exterior of the cabinets at least monthly, or as needed.

The following maintenance variations apply to the two types of cabinets. In the 24-drawer type, lightly oil the hinges monthly and coat the drawer slides with petrolatum twice a year. The modular cabinets usually have nylon drawer guides which do not need lubrication. If the modular-type cabinets are mobile, keep the casters clean by scraping them with the back edge of a knife. The wheel bearings require lubrication monthly; use one drop of oil.

Exercises (093):

Identify each of the following statements as either true (T) or false (F).

_ 1. Drawers of the older basic type dental instrument cabinets (24-drawers) have drawer slides that need lubrication.

_ 2. In the 24-drawer type of cabinet, lubrication consists of heavily oiling the hinges daily and coating the drawer slides with pertrolatum daily.

_ 3. Mobile modular-type cabinet lubrication includes scraping casters clean with the back edge of a knife and applying one drop of oil monthy to wheel bearings.

_ 4. The nylon drawer guides used on the newer cabinets (1-12 drawers) need frequent lubrication.

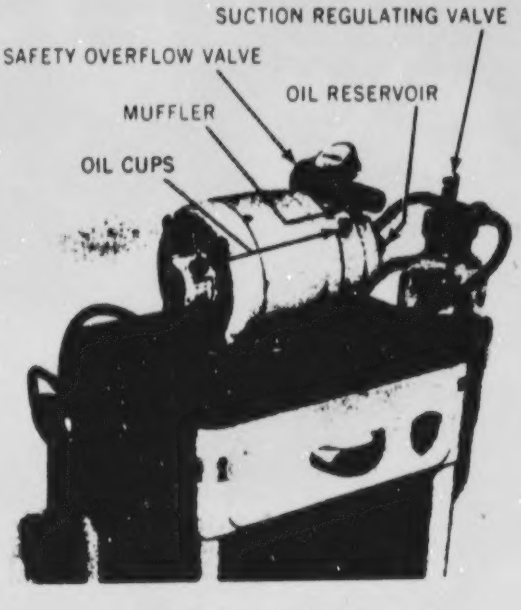


Figure 5-6. Aspirator.

41

094. Fill in blanks in statements concerning aspirator maintenance, and answer key questions about user-maintenance procedures required for oral-suction apparatus.

Aspirators. These are vacuum devices used to keep the operating field clear. An aspirator is illustrated in figure 5-6. Refer to this figure frequently during this discussion. The aspirator has an electric motor that operates a vacuum pump. A bottle connected to the vacuum pump holds aspirated material. Leading from this bottle is a rubber tube, to which a handle is attached. This handle has tips of various sizes. A valve located on top of the vacuum bottle is used to adjust the amount of suction at this tip. There is a safety overflow valve between the bottle and the vacuum pump. This valve contains a chamois disk. This disk must be dry. When it is wet, it stops the flow of air and cuts off the suction. The dry disk protects the pump from fluids that may overflow from the bottle.

Inspect the aspirator each morning before starting the day's work. Inspect the electric cord to see if it is long enough and if it needs repair. The cord must be equipped with a grounded plug. The motor and pump mounts must be secure. You must be able to vary the pressure from 0 to 20 pounds. The motor and pump must start operating as soon as they are turned on. They must operate with no excessive vibration. Certain items, including the cotton muffler and the oil reservoir, require a weekly check. The electric motor requires lubrication monthly.

You must maintain the oil level in the reservoir. Change the cotton in the muffler when it becomes moistened with oil. There are two oil cups, one on each end of the motor. Place two drops of oil in each of these. After each use, flush a generous amount of water through the suction system. This prevents clogging. If the bottle overflows, you must replace the chamois disk with a dry one. After each operation, empty the bottle and put an inch of water in it. The handles and tips must be removed and autoclaved; the rest of the unit is cleaned with a 70-percent solution of isopropyl alcohol.

Oral Evacuators. The ultra-speed handpieces, using water as a coolant, have come into general use. This water must be removed from the patient's mouth. Neither the saliva ejector nor the aspirator can remove it rapidly enough. The high-speed turbine oral evacuator is a more efficient way to remove it. The principle of this evacuator is low pressure and high volume. Larger tips may be attached to these units to allow for faster evacuation of fluids and debris. They will not injure the oral tissues. These units are supplied as table models, portable units, or units which may be attached to the light arm or the wall. The units attached to the light arm are usually equipped with an automatic drain into the cuspidor. The other units have a self-contained canister which must be emptied periodically. All units are equipped with a filter, which may be either a bag or a wire screen. Clean or change the filter at the end of each day. Clean and polish the oral evacuator weekly.

Exercises (094):

Complete each of the following statements by inserting the appropriate word in each blank.

1. Inspect the aspirator each ________. Its electric cord must be sufficiently long, in good repair, and equipped with a ________ plug. The motor and pump must vary the pressure from 0 to ________ pounds and operate with no excessive ________. The cotton muffler and oil reservoir require a ________ check, but the electric motor requires ________ lubrication.

2. Aspirator maintenance includes: (1) Maintaining the ________ level in the reservoir. (2) Changing the cotton in the ________ when it becomes moistened with ________. (3) Placing ________ drops of oil in each oil cup at each end of the motor. (4) After each use (to prevent ________), flushing a generous amount of ________ through the suction.

3. If the aspirator bottle overflows, what do you do with the chamois disk?

4. After each operation, what procedure is necessary for maintaining the aspirator bottle?

5. What must be done periodically with the self-contained canisters of some oral evacuator units?

6. How often is the filter (bag or wire screen) of an oral evacuator cleaned or changed?

42

7. How often is the oral evacuator cleaned and polished?

095. Complete statements about significant features of maintenance procedures for dental operating stools.

Operating Stools. More and more, dental operating stools are playing an important role in the practice of dentistry. This is due largely to new techniques which require the dentist and his assistant to work from seated positions. Several types of these stools are available. The type of stool most often used in sit-down dentistry is the mobile type. Another type of stool that is frequently used in Air Force dental clinics is the single-shaft, solid-base type.

Maintenance on the mobile stools consists of making adjustments and lubricating the caster bearings. These adjustments involve the seat height and the backrest position. Lubricate the caster bearings with lightweight machine oil monthly. Maintenance on the single-shaft stool involves making seat-height adjustments and keeping the stool clean. Never lubricate the shaft on these stools, since doing so would keep the locking mechanism from holding in its adjusted position.

Exercises (095):

Complete each of the following statements by inserting the appropriate word in each blank.

1. Maintenance on mobile stools consists of adjusting the __________ height and the backrest ________, and of lubricating the __________ bearings with lightweight machine oil ________.

2. Maintenance on single-shaft stools includes making seat-height adjustments and keeping the stool __________. Never lubricate the _________, since doing so would keep the _________ mechanism from holding.

096. Given a list of maintenance procedures for sterilizers, match each procedure with the appropriate sterilizer in another list.

Sterilizers. In another volume of this course, you will study the use of the different types of sterilizers. In this section, however, we will discuss the maintenance of sterilizers. Although the Air Force has many different types of sterilizers—such as those using gas, chemicals, and heat—dental clinics use only those which use heat. The most popular ones include the autoclave, dry-heat sterilizer, and the heat-transfer sterilizer, which is often referred to as the "bead" or "flash" sterilizer.

The autoclave uses heat to convert water into steam under pressure. Distilled water should be used. This keeps mineral deposits from accumulating. Each autoclave has a mark to indicate the correct water level. Make sure that water is up to this level before each use. Completely clean the interior weekly. The light scale that may form can be removed with soap, water, and a stiff brush. If you fail to use distilled water, a heavier scale may form. To remove this scale, add 1/2 cup of vinegar to the required amount of water, and operate the autoclave through a regular sterilizing cycle. Remove the vinegar water and rinse the inside thoroughly. Refill the unit to the correct level with distilled water. The autoclave must be on a solid surface, with the electric cord out of the traffic area. The cord must be in good repair with a grounded plug.

Another method of sterilization uses the dry-heat oven. This is a small electric oven. There is little maintenance that you can perform on these ovens. Maintain their appearance by frequent dusting. If they prove to be ineffective, have medical maintenance personnel check them.

Heat-transfer sterilization uses intense heat applied for a short time. The sterilizer using the "flash" principle is a small unit used to sterilize small instruments, such as root canal files (used to smooth root canals in endodontics). This electrically heated sterilizer uses glass beads, salt, or molten metal as a heat-transfer medium. The transfer medium is heated to intense heat (424° F. to 532° F.), and the instrument is inserted into the medium for 3 to 10 seconds. Little maintenance is required for flash sterilizers. The electric cord and plug must be grounded and in good condition. Because of the intense heat, be extremely careful when moving these sterilizers. The heat-transfer media may spill on you, causing a severe burn.

Exercises (096):

Match each statement in column B with the applicable sterilizer in column A by placing the appropriate letter from column B in the blank provided in column A. Some blanks will be matched more than once.

Column A	*Column B*
_ 1. Autoclave.	a. This sterilizer is a small electric oven, upon which you perform little maintenance except frequent dusting.
_ 2. Dry-heat sterilizer.	b. This sterilizer uses heat to convert distilled water into steam under pressure. It has a mark to indicate the correct water level.
_ 3. Heat-transfer sterilizer.	c. On this sterilizer, you remove heavy scale by adding 1/2 cup of vinegar to water and operating the sterilizer through a regular cycle; remove the water, rinse the unit, and refill with distilled water.
	d. This "flash" sterilizer applies intense heat for short durations, but little maintenance is necessary.
	e. Remove light scale from this sterilizer with soap, water, and a stiff brush.
	f. This "flash" sterilizer's electric cord and plug must be grounded and kept in good condition. Be careful when you move the sterilizer as you might receive a severe burn if you spill its heat-transfer medium (glass beads, salt, or molten metal).

097. Given a series of statements concerning dental amalgamators, indicate which are true and which are false.

Amalgamators. An amalgamator is a device used to prepare a mix of dental amalgam. It has a small electric motor which rotates an eccentric cam. A forked prong is attached to this cam. The capsule with alloy and mercury is placed in the forked prong. The cam rotates, causing the prong to move in a figure "8." The amalgamator is equipped with a timer to adjust the mixing time.

User-maintenance of this equipment consists of keeping it clean and polished. You must remove objects which fall through the case at the opening for the prong. To remove these objects, unplug the amalgamator and turn it upside down. Gently rotate it back and forth until the object falls out. Do not remove the case from this equipment. Incorrect replacement can damage the wiring or bearings.

Exercises (097):

Identify each of the following statements as either true (T) or false (F).

_ 1. When the small electric motor of an amalgamator operates, a rotating cam causes the prong to move in a figure "8" pattern.

_ 2. Remove objects which fall through the case at the opening for the prong by reversing the motor.

_ 3. Remove the case from this equipment at any desired time, as the wiring and bearings are constructed so as to be tamperproof.

_ 4. The amalgamator timer can be adjusted to vary the number of seconds of mixing before cutoff.

ANSWERS FOR EXERCISES

CHAPTER 1

Reference:

~~001 - 1. a.~~
~~001 - 2. b.~~
~~001 - 3. b.~~
~~001 - 4. a.~~
~~001 - 5. a.~~

~~002 - 1. The base dental surgeon.~~
~~002 - 2. To insure proper standards of professional patient care.~~
~~002 - 3. He should not delegate this responsibility under any circumstances.~~
~~002 - 4. The various reports submitted by the base dental surgeon.~~
~~002 - 5. By setting up communication lines and arranging clinic schedules and functions to fit the needs of the using organizations.~~
~~002 - 6. He sets up an OJT program by appointing trainers and providing for training aids.~~
~~002 - 7. The training of his assistant surgeon.~~

~~003 - 1. The Air Force Dental Service provides Air Force personnel and members of other uniformed services, as required, oral health service worldwide in support of the overall Air Force medical mission.~~
~~003 - 2. The Air Force Dental Service supports other programs as directed.~~
~~003 - 3. a.~~
~~003 - 4. b.~~
~~003 - 5. b.~~
~~003 - 6. b.~~
~~003 - 7. a.~~
~~003 - 8. a.~~
~~003 - 9. Patient reception, appointment scheduling, and health record maintenance.~~

~~004 - 1. Air Force Manual 39-1, *Airman Classification Manual.*~~
~~004 - 2. At the 3 level and the 5 level.~~
~~004 - 3. Some of the duties may overlap; however, 98170 duties have a general inclination toward more management and supervision.~~
~~004 - 4. The 98191 AFSC.~~
~~004 - 5. d.~~
~~004 - 6. b.~~
~~004 - 7. a, b.~~
~~004 - 8. d.~~
~~004 - 9. d.~~
~~004 - 10. c.~~

~~005 - 1. 90010, Medical Helper.~~
~~005 - 2. Upon graduation from the medical fundamentals course.~~
~~005 - 3. The 98150 AFSC.~~
~~005 - 4. The 982X0, Dental Laboratory, AFSC.~~
~~005 - 5. AFM 50-5, *USAF Formal Schools Catalog.*~~
~~005 - 6. The 983X0 AFSC.~~
~~005 - 7. As a bypassed specialist, a directed duty assignee, or a formal school graduate.~~
~~005 - 8. Job knowledge and job proficiency training.~~
~~005 - 9. Recommendation by the classification board or a successful score on the AKT (or both).~~
~~005 - 10. Completion of a management course.~~

CHAPTER 2

Reference:

006 - 1. You should not be inattentive, indifferent, or abrupt.
006 - 2. A pleasant disposition, tact, and a calm, courteous, and efficient manner.
006 - 3. Physical and psychological.
006 - 4. Food, water, shelter, rest, exercise, sex, and physical well-being.
006 - 5. Security, recognition, affection, and achievement.
006 - 6. d.
006 - 7. e.
006 - 8. a.
006 - 9. c.
006 - 10. T.
006 - 11. T.
006 - 12. F.
006 - 13. T.
006 - 14. F.
006 - 15. T.
006 - 16. F.

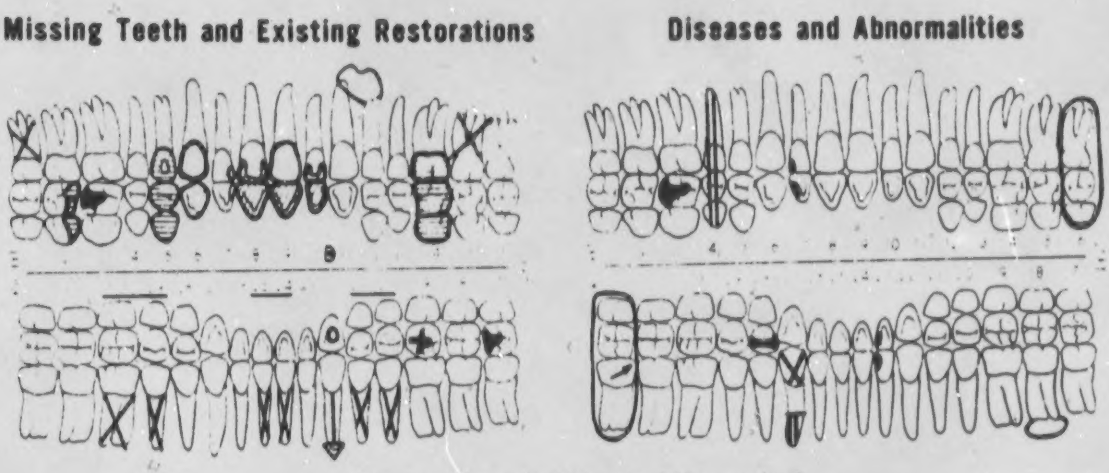
007 - 1. F.
007 - 2. T.
007 - 3. F.
007 - 4. F.
007 - 5. F.
007 - 6. T.
007 - 7. F.
007 - 8. T.
007 - 9. T.

~~008 - 1. Look at his identification card.~~
~~008 - 2. a.~~
~~008 - 3. b.~~
~~008 - 4. a.~~
~~008 - 5. a.~~
~~008 - 6. a.~~
~~008 - 7. a.~~
~~008 - 8. a.~~
~~008 - 9. b.~~

45

MODIFICATIONS

Page 122 of this publication has (have) been deleted in adapting this material for inclusion in the "Trial Implementation of a Model System to Provide Military Curriculum Materials for Use in Vocational and Technical Education." Deleted material involves extensive use of military forms, procedures, systems, etc. and was not considered appropriate for use in vocational and technical education.


Missing Teeth and Existing Restorations

Diseases and Abnormalities

Figure 1. Answer for Objective 017, exercise 1.

017 - 1.

018 - 1. Member; active.
018 - 2. Blue.
018 - 3. Manila.
018 - 4. Typing; ink.
018 - 5. Closed.
018 - 6. Capital.
018 - 7. Pencil.

019 - 1. T.
019 - 2. F.
019 - 3. T.
019 - 4. F.

020 - 1. It is a chronological record of a person's dental condition during his period of military service. It is used as a means of verifying an individual's dental condition and treatment, and it is an important source of information for identifying deceased personnel.
020 - 2. The individual's dento-oral condition upon his entry into military service.
020 - 3. A dental officer.
020 - 4. They are made in black or blue-black ink with a fine-point pen.
020 - 5. The time of the original examination.
020 - 6. Because they may change, and penciled entries are easy to change.
020 - 7. Subsection 15, Restorations and Treatments; subsection 16, Subsequent Diseases and Abnormalities; and subsection 17, Services Rendered.
020 - 8. When no space for entering the treatment rendered is available in subsection 15, an SF 603A is initiated.
020 - 9. Major identifying features are entered in item 15; current treatment requirements are entered in item 16.

021 - 1. AF Form 528 provides an accurate record of the presence and location of any gingival or periodontal problems requiring treatment; it also gives a general estimate of the health of the tooth-supporting structures.
021 - 2. The inception and progress of gingival and periodontal disease.
021 - 3. AFM 162-3, *The Periodontal Screening Procedure.*

022 - 1. T.
022 - 2. F.
022 - 3. F.
022 - 4. T.
022 - 5. T.
022 - 6. F.

023 - 1. T.
023 - 2. F.

024 - 1. This form provides information necessary for maintaining a patient's individual dental health records; it provides statistical data for the dental service report, thereby informing higher headquarters of the dental procedures performed by the clinic.
024 - 2. Because the form is used to provide information for keypunching.

47

MODIFICATIONS

Pages 124 - 127 of this publication has (have) been deleted in adapting this material for inclusion in the "Trial Implementation of a Model System to Provide Military Curriculum Materials for Use in Vocational and Technical Education." Deleted material involves extensive use of military forms, procedures, systems, etc. and was not considered appropriate for use in vocational and technical education.

060 - 2. This means that a supervisor cannot properly supervise too many people and that he should not oversupervise too few.
060 - 3. This term means that a person should have only one boss.
060 - 4. Because he can't do everything himself.

061 - 1. (1) Determine how the task is being done, (2) evaluate each step of the task, (3) apply work simplification principles, (4) get any necessary approval, (5) implement your improvements, and (6) make a followup evaluation.
061 - 2. Eliminate unnecessary work; combine details when practical; rearrange for better sequence; simplify the work through motion economy.

062 - 1. To upgrade personnel to the next skill level and to give instruction on changes in technique, equipment, and materials.
062 - 2. Informal.
062 - 3. Formal.
062 - 4. It is a systematic, reportable application of self-study and the craftsman-apprentice principle.

063 - 1. Through the use of this record, the Air Force insures that its airmen have been trained to a particular standard so that they can perform predictably, effectively, and efficiently.
063 - 2. The supervisor can use this record to select airmen for duty assignments, positions, and upgrade actions.
063 - 3. b.
063 - 4. a.
063 - 5. c.
063 - 6. b.
063 - 7. c.
063 - 8. a.
063 - 9. The trainee and the supervisor enter the date and their initials next to the STS/JPG task element to indicate its completion.

064 - 1. In the treatment rooms.
064 - 2. One that has adequate lighting and ventilation and that is relatively free of distractions.
064 - 3. From the base film library.
064 - 4. You may order them from the list of films maintained by the squadron OJT monitor or from suppliers of dental materials.

065 - 1. Establishing your objectives, selecting an instructional method, preparing the lesson plan, presenting the lesson, and measuring the results.
065 - 2. What you expect the student to know or perform as a result of your training.

066 - 1. c.
066 - 2. e.
066 - 3. d.
066 - 4. c.
066 - 5. b.
066 - 6. e.
066 - 7. a.
066 - 8. a.
066 - 9. c.

067 - 1. T.
067 - 2. T.
067 - 3. F.
067 - 4. T.
067 - 5. F.
067 - 6. T.
067 - 7. T.

068 - 1. Before the scheduled training time.
068 - 2. Inadequate planning.
068 - 3. Vary the pitch, rate, and force of your voice to emphasize points and to keep your voice from becoming monotonous.
068 - 4. Use natural hand and body gestures and avoid physical distractions, such as coin jingling, pacing, and head scratching.
068 - 5. It shows them you are interested in them and allows you to check for signs of doubt, confusion, or boredom.
068 - 6. To the desired objectives.

069 - 1. To determine if it was effective and if it accomplished what it was intended to accomplish.
069 - 2. Short answer or multiple choice types are preferred. True—false tests and essay tests should be avoided.
069 - 3. If your training was intended to teach the student how to perform, you should, of course, check to see that he can perform to your standards by means of a performance test. If you intended for him to acquire rote knowledges or if specific knowledge is important to his performance, you should use a written test.
069 - 4. The lesson objectives.

CHAPTER 5

Reference:

070 - 1. An instructor in a formal technical course, your OJT supervisor, or both.
070 - 2. Know the equipment and how to operate it safely.
070 - 3. Read its operating instructions very carefully.

071 - 1. Law observance. (It comes from within you.)
071 - 2. You do.

072 - 1. F.
072 - 2. T.

073 - 1. b, c.
073 - 2. e.
073 - 3. d.
073 - 4. h.

074 - 1. F.
074 - 2. T.
074 - 3. T.

075 - 1. Avoid.
075 - 2. Maximum.
075 - 3. Minimize.
075 - 4. Extinguish; prevent.

076 - 1. F.
076 - 2. T.

077 - 1. b, c.
077 - 2. d.

078 - 1. The nature of the task.
078 - 2. These instructions may deal with the materials, protective clothing, machine guards, and type of machine or equipment that you will use to do the job.

079 - 1. e, f.
079 - 2. c, e, f.
079 - 3. a.
079 - 4. b, d.
079 - 5. g, h.
079 - 6. h, i.

080 - 1. T.
080 - 2. T.
080 - 3. F.
080 - 4. T.
080 - 5. F.

081 - 1. (a) Keeping dirt and filth at the lowest level possible, and (b) keeping the facility in a presentable condition.
081 - 2. Daily.
081 - 3. Remove dust and micro-organisms by vacuuming carpeting at the end of each duty day. Remove spots by shampooing, if possible. Do not use solvents without consulting your NCOIC.
081 - 4. (a) At least weekly; (b) about every 3 weeks.
081 - 5. Local conditions.
081 - 6. (a) Use a stocklisted window cleaner; (b) add a small amount of ammonia to water.
081 - 7. Daily.
081 - 8. Make certain that the electrical switch is in the OFF position.
081 - 9. With a soft, dry cloth—daily.
081 - 10. They are drycleaned.

082 - 1. Outside; parking lot.
082 - 2. Clean; cobwebs.
082 - 3. Litter.

083 - 1. b.
083 - 2. a.
083 - 3. c.
083 - 4. d, e.

084 - 1. Only slightly since they differ in design, shape, and manufacture.
084 - 2. Manuals prepared by the equipment manufacturers.
084 - 3. Make a visual inspection for obvious problem areas and follow it with an operational check of the water, air, gas, and electrical systems.
084 - 4. Loose connections, and defective washers and valves.
084 - 5. (a) Excessive moisture in the air system; it can be corrected by draining the air tank and purging the air lines daily. (b) Incorrect air pressure at critical points; it can be adjusted by following the manufacturer's instructions.
084 - 6. Turn them over to the medical equipment repairman.
084 - 7. When you first notice signs of fraying.
084 - 8. The screw is turned until the highest possible pitch of sound is heard.
084 - 9. Use a silicone spray (dry) lubricant.
084 - 10. Corrosion, with eventual clogging of the entire drainage system.
084 - 11. Clean the screen and run a cup of water through the system.

085 - 1. Lowered; electrically.
085 - 2. Exterior; oil; good; tears; damage.
085 - 3. UP; rise; wobble.
085 - 4. Electric; foot.
085 - 5. Inner; qualified.
085 - 6. Motor; instructions.
085 - 7. Air.
085 - 8. Lower; lowest.
085 - 9. Loosen; counterclockwise.
085 - 10. Clockwise; counterclockwise.
085 - 11. Drop; months.

086 - 1. T.
086 - 2. F.
086 - 3. T.

087 - 1. Whenever it overheats or after every 10 hours of general use—whichever comes first.
087 - 2. Disassembly, cleaning, lubrication, and reassembly.
087 - 3. First, unscrew the tightening rod; remove it and the collet nut. Lastly, remove the bur chuck and chuck lock plunger from the spindle.
087 - 4. After all parts are dried, they are lubricated and reassembled. The procedure for reassembly is in the reverse order of disassembly. You may reassemble the handpiece as you lubricate it.
087 - 5. Loosen the tightening rod, turn the collet nut clockwise, and use finger pressure until the end play is removed.

088 - 1. T.
088 - 2. T.
088 - 3. F.
088 - 4. T.
088 - 5. F.
088 - 6. F.

089 - 1. Belt; less; important.
089 - 2. Sheath.
089 - 3. Chuck; spindle.
089 - 4. Lightweight.
089 - 5. Sealed; two.

090 - 1. b.
090 - 2. c.
090 - 3. d.
090 - 4. a.
090 - 5. e.
090 - 6. f.
090 - 7. g.

091 - 1. b.
091 - 2. a, b.
091 - 3. c, d.

092 - 1. Changing burned out bulbs.
092 - 2. Onto the dental operating unit.
092 - 3. Use a dry towel.
092 - 4. About every 6 months, apply lightweight machine oil to the joints in minute amounts.

093 - 1. T.
093 - 2. F.
093 - 3. T.
093 - 4. F.

094 - 1. Morning; grounded; 20; vibration; weekly; monthly.
094 - 2. Oil; muffler; oil; two; clogging; water.
094 - 3. Replace it with a dry one.
094 - 4. Empty it, then put an inch of water in it.
094 - 5. They must be emptied.
094 - 6. At the end of each day.
094 - 7. Weekly.

095 - 1. Seat; position; caster; monthly.
095 - 2. Clean; shaft; locking.

096 - 1. b, c, e.
096 - 2. a.
096 - 3. d, f.

097 - 1. T.
097 - 2. F.
097 - 3. F.
097 - 4. T.

☆U.S. GOVERNMENT PRINTING OFFICE:1974- 640-058/304
AUGAFS, ALA (751365) Jan 75-2900

STOP–

1. MATCH ANSWER SHEET TO THIS EXERCISE NUMBER.

2. USE NUMBER 1 OR NUMBER 2 PENCIL.

98150 01 24

EXTENSION COURSE INSTITUTE
VOLUME REVIEW EXERCISE
ADMINISTRATION, SAFETY, AND MAINTENANCE

Carefully read the following:

DO'S:

1. Check the "course," "volume," and "form" numbers from the answer sheet address tab against the "VRE answer sheet identification number" in the righthand column of the shipping list. If numbers do not match, take action to return the answer sheet and the shipping list to ECI immediately with a note of explanation.
2. Note that numerical sequence on answer sheet alternates across from column to column.
3. Use a medium sharp #1 or #2 black lead pencil for marking answer sheet.
4. Circle the correct answer in this test booklet. After you are sure of your answers, transfer them to the answer sheet. If you *have* to change an answer on the answer sheet, be sure that the erasure is complete. Use a clean eraser. But try to avoid any erasure on the answer sheet if at all possible.
5. Take action to return entire answer sheet to ECI.
6. Keep Volume Review Exercise booklet for review and reference.
7. If *mandatorily* enrolled student, process questions or comments through your unit trainer or OJT supervisor.
   If *voluntarily* enrolled student, send questions or comments to ECI on ECI Form 17.

DON'TS:

1. Don't use answer sheets other than one furnished specifically for each review exercise.
2. Don't mark on the answer sheet except to fill in marking blocks. Double marks or excessive markings which overflow marking blocks will register as errors.
3. Don't fold, spindle, staple, tape, or mutilate the answer sheet.
4. Don't use ink or any marking other than a #1 or #2 black lead pencil.

NOTE: NUMBERED LEARNING OBJECTIVE REFERENCES ARE USED ON THE VOLUME REVIEW EXERCISE. In parenthesis after each item number on the VRE is the *Learning Objective Number* where the answer to that item can be located. When answering the items on the VRE, refer to the *Learning Objectives* indicated by these *Numbers*. The VRE results will be sent to you on a postcard which will list the *actual* VRE *items you missed*. Go to the VRE booklet and locate the *Learning Objective Numbers* for the items missed. Go to the text and carefully review the areas covered by these references. Review the entire VRE again before you take the closed-book Course Examination.

10-1

Multiple Choice

1. (001) Which individual in the AF Dental Service serves as a clearinghouse for USAF directives, receives "feedback" from his field organizations, and insures that USAF and command policies are being implemented?

   a. Base dental surgeon.
   b. Command dental surgeon.
   c. Surgeon General of the Air Force.
   d. Assistant Surgeon General for Dental Services.

2. (002) What is the primary professional responsibility of the base dental surgeon?

   a. Insure proper standards of professional patient care.
   b. Maintain proper functioning of USAF Preventive Dentistry Program.
   c. Act as chief administrator of all base dental programs and training.
   d. Establish training standards for upgrade training of dental personnel.

3. (003) Providing Air Force personnel oral health services worldwide in support of the overall Air Force medical mission is the dental service's

   a. primary mission.
   b. secondary mission.
   c. primary responsibility.
   d. professional responsibility.

4. (003) Within a base dental clinic, who is directly responsible for the supervision, training, work assignments, and evaluation of the enlisted dental personnel?

   a. NCOIC.
   b. Clinic OIC.
   c. Base dental surgeon.
   d. Chief of Professional Services.

5. (004) The major difference between personnel holding a 98130 AFSC and those holding a 98150 AFSC is the

   a. type of duties performed.
   b. tasks performed.
   c. variety of duties performed.
   d. depth of knowledge and proficiency expected.

6. (005) What AFSC must a dental specialist attain prior to entry into the preventive dentistry specialty?

   a. 98130.
   b. 98131.
   c. 98150.
   d. 98250.

7. (005) What rank is usually held by those with the 98150 AFSC, Dental Specialist?

   a. E-1 or E-2.
   b. E-2 or E-3.
   c. E-3 or E-4.
   d. E-4 or E-5.

8. (006) Which is the most important reason for applying the principles of patient psychology when you are receiving patients?

   a. Addressing a patient by both his name and rank will help assure you have the right patient.
   b. Using patient psychology is necessary to achieve the best actual patient treatment procedures.
   c. The manner in which you receive the patient may have a more profound impact than the actual treatment.
   d. The quality of the professional care is totally incumbent upon the way in which the patient is received.

9. (006) Which general principle below identifies a desirable telephone mannerism for a dental receptionist?

   a. Avoid letting your voice show a smile.
   b. Be extremely firm and businesslike in all situations.
   c. Offer complete help on the telephone including the diagnosis of the patient's condition.
   d. Speak as a representative of the dental clinic and reflect an eagerness to help.

10. (008) Army or Navy personnel assigned to duty with the Air Force receive outpatient dental treatment on what basis?

    a. They receive emergency care only.
    b. They are treated after all members of the Air Force are cared for.
    c. They may receive routine dental treatment on a space-available basis.
    d. They receive treatment on the same basis as Air Force personnel.

11. (009) By using both the front and back of AF Form 1223a, Dental Appointment Register, you can schedule appointments for

    a. eight operators for 1 day or one operator for 8 days.
    b. six operators for 1 day or one operator for 6 days.
    c. four operators for 1 day or one operator for 4 days.
    d. two operators for 1 day or one operator for 2 days.

12. (010) If bitewing radiographs were taken during the past 12 months, what type of examination may be given to fulfill the annual examination requirement?

    a. Type 2.
    b. Type 3.
    c. Type 4.
    d. Type 5.

13. (011) What type of dental examination consists of a mouth mirror and explorer examination with adequate artificial illumination and posterior bitewing radiographs?

    a. Type 1.
    b. Type 2.
    c. Type 3.
    d. Type 4.

14. (012) What dental classification would apply to a patient who has minor or incipient caries that do not endanger the pulp?

    a. Class 1.
    b. Class 2.
    c. Class 3.
    d. Class 4.

15. (013) Who has the general responsibility for including on dental records an accurate and appropriate entry for a dental professional service that has been rendered?

    a. The records clerk.
    b. The dental clinic NCOIC.
    c. The dental officer who performed the service.
    d. The dental assistant or dental technician involved.

16. (014) Which of the following is a temporary, rather than a permanent, content of a dental record?

    a. AF Form 696, Dental Patient History.
    b. Original SF 603, Dental Health Record.
    c. AF Form 528, Periodontal Scoring Chart.
    d. AF Form 644, Record of Dental Attendance.

17. (015) When available, you should use cardboard mounts for which of the following types of radiographs?

    a. Periapical.
    b. Exal-oral.
    c. Occlusal.
    d. Bitewing.

18. (016) How would a mandibular right side second bicuspid with facial lingual surfaces be abbreviated in a dental record?

    a. #4-MI.
    b. #13-FL.
    c. #20-LB.
    d. #29-FL.

19. (017) To correctly chart an apicoectomy, you would

    a. outline the defective area and block in solidly.
    b. trace a jagged fracture line in the relative position on the root.
    c. draw a small triangle at the approximate line of the root amputation.
    d. circle the missing portion of the root and place a small "X" in the circle.

20. (018) Dental treatment folders of flying personnel are identified by

    a. their distinctive blue color.
    b. writing "flying personnel" in blue ink across the front of the cover.
    c. placing a blue tab on the top right-hand side of the cover.
    d. darkening in with blue the space between the "S" square and the "AD" square on the cover.

21. (019) When should negative dental patient histories (AF Forms 696) be destroyed?

    a. Never.
    b. After 90 days.
    c. After 2 years.
    d. As soon as a new history is completed.

22. (020) What are the entries in Section I, Dental Examination, of the SF 603 (Health Record—Dental) intended to reflect?

    a. The patient's general health data.
    b. The patient's dental health history prior to entry into the service.
    c. The patient's dental condition upon entry into the service.
    d. The restorations completed during the patient's military service.

23. (021) If an AF Form 928, Periodontal Scoring Chart, is used to record data, where and for how long is it kept?

    a. It is permanently filed with the patient's medical records.
    b. It is retained for 1 year in the patient's medical records.
    c. It is retained for 1 year in the patient's dental records.
    d. It and subsequent charts are kept permanently in the dental treatment folder.

24. (022) If a medical officer requests a dental consultation using an SF 513, when is treatment given to the patient if a dental problem is discovered?

    a. Not unless authorized by the medical officer making the request for the consultation.
    b. Not before an SF 515 is returned to the requesting medical officer.
    c. Only if authorized by the base dental officer.
    d. If determined necessary by the consultant.

71. ~~(064) Where is most training conducted in the dental clinic?~~

   ~~a. In the NCOIC's office.~~
   ~~b. In the conference room.~~
   ~~c. In the actual dental treatment rooms.~~
   ~~d. In the dental superintendent's office.~~

72. ~~(065) What is the first step one should perform when developing a training program or lesson?~~

   ~~a. Establish the objectives.~~
   ~~b. Develop the lesson plan.~~
   ~~c. Prepare measurement tools.~~
   ~~d. Select the instructional method.~~

73. ~~(066) What lesson presentation method employs the "show and tell" principle?~~

   ~~a. Lecture method.~~
   ~~b. Discussion method.~~
   ~~c. Performance method.~~
   ~~d. Demonstration method.~~

74. ~~(067) Which of the following is a good way to develop relationships in the body of a lesson plan?~~

   ~~a. From present to past.~~
   ~~b. From complex to simple.~~
   ~~c. From known to unknown.~~
   ~~d. From less frequently used to most frequently used.~~

75. ~~(068) In order to make your lesson presentation interesting, you should do all of the following except~~

   ~~a. vary the pitch of your voice.~~
   ~~b. keep your voice in a monotone.~~
   ~~c. change the force of your voice to emphasize key points.~~
   ~~d. vary the rate of your speech.~~

76. ~~(069) Upon completion of a training program, what should your phase test measure?~~

   ~~a. The lesson objectives.~~
   ~~b. The students' depth of knowledge.~~
   ~~c. The knowledge the students have gained through outside reading.~~
   ~~d. The skill level requirements a step above those of the students.~~

77. ~~(070) Which statement below describes an undesirable action concerning general safety principles related to preoperational training?~~

   ~~a. Operators should know the proper way to operate the equipment.~~
   ~~b. Formal technical courses teach preoperational training.~~
   ~~c. Your OJT supervisor will give preoperational training of operating equipment.~~
   ~~d. Skilled operators of old equipment normally have no need to read instructions for new or unfamiliar equipment.~~

78. (071) In accordance with the general safety principle of discipline, the person having the primary responsibility to safety check equipment in your work area is

   a. you.
   b. your supervisor.
   c. the ground safety officer.
   d. the medical equipment repair NCO.

79. (072) In order to conform with the general safety principle of alertness, you must do your best to keep from being mentally or physically

- a. aware.
- b. alert.
- c. disciplined.
- d. sidetracked.

80. (073) Which action listed below is not a safety practice?

- a. Cut away from yourself.
- b. Work at a moderate, consistent pace.
- c. Lift with your back, not with your arms or legs.
- d. Use tools or instruments only for their designed purpose.

81. (074) Which statement concerning the general safety principle of mental and physical fitness is correct?

- a. Sight or hearing difficulties rarely cause accidents.
- b. Mental worries are unrelated to alertness and accidents.
- c. Physical exercise programs normally have no effect on accident reduction.
- d. Mental fitness should be approached in a similar manner to physical fitness.

82. (075) Elimination of which of the following elements is the secret to extinguishing fires?

- a. Fuel.
- b. Oxygen.
- c. Heat.
- d. Any of the above elements.

83. (076) Which of the following general safety principles is incorrectly stated as it concerns proper equipment maintenance?

- a. A defective electric switch is hazardous even if it works.
- b. Worn or loose parts and parts out of adjustment are all hazardous.
- c. Any machine not in good condition constitutes a safety hazard.
- d. The cutting edge of tools should be kept dull or semisharp to avoid serious accidents.

84. (077) Which statement below describes an environment that is not safety oriented?

- a. Equipment layout that provides ample working space.
- b. Equipment arranged so that the operator can easily see a hallway, window, or doorway.
- c. Handtools and machine tools kept clean and free from unnecessary grease.
- d. Workbenches and floors that are uncluttered and clean.

85. (078) The amount of safety preoperational planning that should precede the beginning of your operations depends upon the

- a. amount of supervision available.
- b. nature of the tasks to be accomplished.
- c. attitude of your supervisory personnel.
- d. number of regulatory publications imposed upon you.

86. (079) Which of the following procedures should you follow if you smell a small propane gas leak?

- a. Report the leak, eliminate fire hazards, and establish fresh air ventilation.
- b. Report the leak, establish ventilation, and light a Bunsen burner to dissipate the gas.
- c. Remove oxygen equipment from the area and then call the fire department.
- d. Evacuate the clinic, close all doors and windows, and call the fire department.

87. (080) With regard to dental equipment, the key to good housekeeping is to

   a. clean it only when it appears dirty.
   b. always wait to be directed to perform the cleaning.
   c. make a habit of cleaning at prescribed intervals.
   d. thoroughly clean any equipment on which microorganisms are visible.

88. (081) Prior to dismantling lighting fixtures for their periodic cleaning, you should

   a. disconnect and remove the light switch.
   b. ground the light switch with a safety wire.
   c. place the switch in the OFF position and make provisions so it cannot inadvertently be turned ON.
   d. turn the fuse box switch connected to the electrical switch to the OFF position and lock the door of the fuse box.

89. (082) Normally, good housekeeping for the outside area of a dental clinic includes keeping the parking lot free from

   a. cars.
   b. weeds.
   c. litter.
   d. rodents.

90. (083) The maintenance performed by a medical equipment repair center (MERC) functioning on a geographic basis is

   a. area maintenance.
   b. field maintenance.
   c. preventive maintenance.
   d. organizational maintenance.

91. (084) Probably the best approach to preventive maintenance of dental equipment consists of a visual inspection followed by an operational check at the

   a. close of each duty day.
   b. beginning of each duty day.
   c. time of inspection by a medical equipment repairman.
   d. time of the installation of the new equipment and at monthly intervals.

92. (084) What air system problem encountered with dental operating units is correctable by draining the air tank and purging the air lines daily?

   a. Air is too dry.
   b. Air pressure is too low.
   c. Air pressure is too high.
   d. Air contains excessive moisture.

93. (085) To expel air from the hydraulic system of a dental operating chair, the first step is to

   a. remove the electric motor, the seat cushion, and the air vent screw.
   b. remove the hand lever, the seat cushion, and the air vent screw.
   c. lower the chair to its lowest position, remove the seat cushion, and locate the air vent screw.
   d. raise the chair to its highest position, remove the seat cover, and remove the air vent screw.

94. (085) What type of hydraulic fluid is used with most dental operating chairs?

   a. SAE 20-weight motor oil.
   b. SAE 10W40-weight motor oil.
   c. Lightweight automotive-type hydraulic fluid.
   d. Heavyweight automotive-type hydraulic fluid.

95. (086) The range of speed of all three classifications (conventional-speed, high-speed, and ultra-speed) of dental handpieces is from a low of

a. 12,000 rpm to a high of 100,000 rpm.
b. 12,000 rpm to a high of 300,000 rpm.
c. 6,000 rpm to a high of 500,000 rpm.
d. 100,000 rpm to a high of 500,000 rpm.

96. (086) If dental handpieces are not given constant preventive attention consisting of cleaning and lubricating, a likely malfunction due to abrasives would be

a. lowered operating speeds.
b. excessive oil consumption.
c. wavering speeds and excessive noise.
d. undue vibration resulting in excessive wear.

97. (087) How often should the conventional-speed straight handpiece be lubricated?

a. Only when it malfunctions.
b. After 20 hours of general use.
c. Only when overheating is noticed.
d. Whenever it overheats or after every 10 hours of general use.

98. (087) Which of the following items should never be used when cleaning dental handpieces?

a. Cotton-tipped applicators.
b. Handpiece cleaner.
c. Paper toweling.
d. Pipe cleaners.

99. (088) The conventional-speed, contra-angle handpiece should be lubricated after every

a. hour of use.
b. 5 hours of use.
c. 10 hours of use.
d. 15 hours of use.

100. (089) The disassembly of the belt-driven, high-speed straight handpiece for cleaning and lubrication

a. involves only the removal of the sheath.
b. involves the complete breakdown of all component parts.
c. is much more complex than that of the slower handpieces.
d. is of no importance, as oil-impregnated bearings require no lubrication or cleaning.

101. (090) The best rule to follow concerning the lubrication of the ultra-speed handpiece is to

a. lubricate after every 5 hours of general use.
b. clean and lubricate after every 10 hours of general use.
c. read and closely follow the manufacturer's instructions.
d. lubricate only when directed to do so by a dental officer.

102. (091) Which one practice listed below should be avoided in the maintenance of diamond-coated rotary instruments because it causes deterioration of the bonding material?

a. Soaking the instrument in soapy water and then scrubbing debris away with a bristle brush.
b. Using an ink eraser for cleaning debris from the instrument's grit.
c. Soaking the instrument in pure mercury as a part of amalgam removal.
d. Boiling and autoclaving the instrument.

103. (092) Which of the following items should you use when changing the bulb in the dental operating light?

a. A voltmeter.
b. A dry towel.
c. A pair of pliers.
d. A wet gauze sponge.

104. (093) The newer (modular) type of dental instrument cabinet usually has nylon drawer guides which require

a. no lubrication.
b. lubrication daily.
c. one drop of oil monthly.
d. coating with petrolatum weekly.

105. (094) If the bottle of the dental aspirator overflows, you must

a. adjust the valve located on top of the vacuum bottle.
b. replace the rubber tube leading from the bottle.
c. replace the chamois disk with a dry one.
d. change the cotton in the muffler.

106. (095) What is a normal result of lubricating the single shaft of dental operating mobile stools?

a. The stool base will malfunction.
b. The castor bearing will deteriorate.
c. The shaft will attract dirt and clog the sliding mechanism.
d. The locking mechanism will not hold in its adjusted position.

107. (096) What action should you take to remove heavy scale from the inside of an autoclave?

a. Lightly sand the inner chamber with "wet-and-dry" sandpaper.
b. Scrub with mild soap and water solution using a piece of steel wool.
c. Use the wide blade of the ultrasonic tooth cleaner to remove the deposits through its vibrating action.
d. Add one-half cup vinegar to the required amount of water and operate the autoclave through its regular cycle.

108. (097) When the small electric motor of an amalgamator operates, a rotating cam causes the prong to move in what kind of pattern?

a. Oval.
b. Circular.
c. Figure "8."
d. Up and down.

98150 02 7501

CDC 98150

DENTAL SPECIALIST

(AFSC 98150)

Volume 2

Basic Dental Sciences

Extension Course Institute

Air University

10-1

PREPARED BY
SCHOOL OF HEALTH CARE SCIENCES, USAF (ATC)
SHEPPARD AIR FORCE BASE, TEXAS

EXTENSION COURSE INSTITUTE, GUNTER AIR FORCE STATION, ALABAMA

THIS PUBLICATION HAS BEEN REVIEWED AND APPROVED BY COMPETENT PERSONNEL
OF THE PREPARING COMMAND IN ACCORDANCE WITH CURRENT DIRECTIVES
ON DOCTRINE, POLICY, ESSENTIALITY, PROPRIETY, AND QUALITY.

62

Preface

THIS SECOND volume of your career development course (CDC) presents the basic dental sciences that are of concern to your job proficiency. These knowledges are beneficial in several ways. For example, they allow you to communicate with the dental officers in the terminology native to your vocation; they enable you to present a more professional image to the patients; and they allow you to perform better in your job, because they have given you the background knowledge you need to understand your job. As in the other volumes of this CDC, we review the material necessary to prepare you for your promotion testing (SKT), and we present new information to advance your knowledge in dental technology.

Chapter 1 presents a comprehensive study of oral anatomy and physiology. The second chapter is concerned with the diseases and conditions common to dental patients. The next chapter discusses the various therapeutic agents and aids used in dentistry. Chapter 4 presents the subjects of basic microbiology and sterilization.

Foldouts 1 through 4 are included at the back of this volume. Whenever you are referred to one of these, turn to the back of the volume and locate it.

If you have questions on the accuracy or currency of the subject matter of this text, or recommendations for its improvement, send them to School of Health Care Sciences/MST, Sheppard AFB TX 76311.

If you have questions on course enrollment or administration, or on any of ECI's instructional aids (Your Key to Career Development, Behavioral Objective Exercises, Volume Review Exercise, and Course Examination), consult your education officer, training officer, or NCO, as appropriate. If he can't answer your questions, send them to ECI, Gunter AFS AL 36118, preferably on ECI Form 17, Student Request for Assistance.

This volume is valued at 39 hours (13 points).

Material in this volume is technically accurate, adequate, and current as of September 1974.

.63

Contents

Page

Preface.. *iii*

Chapter

1 Oral Anatomy and Physiology 1

2 Oral Pathology.. 30

3 Dental Therapeutics 53

4 Basic Microbiology and Sterilization 69

Answers for Exercises.................................. 81

72

CHAPTER 1

NOTE: In this volume, the subject matter is developed by a series of Learning Objectives. Each of these carries a 3-digit number and is in boldface type. Each sets a learning goal for you. The text that follows the objective gives you the information you need to reach that goal. The exercises following the information give you a check on your achievement. When you complete them, see if your answers match those in the back of this volume. If your response to an exercise is incorrect, review the objective and its text.

Oral Anatomy and Physiology

THE SUCCESSFUL dental specialist must obtain a thorough knowledge of oral anatomy and physiology. This knowledge is necessary when you are completing dental treatment records and other related forms and when you are discussing treatment procedures with the dentists. Although you have already received extensive training in the oral anatomy and physiology areas, we feel this chapter is needed to reinforce your past training.

In this chapter, we discuss the cranial and facial bones of the skull, the structure and innervation of the oral cavity, the deciduous and permanent dentition, the structures of the teeth, and the oral mucosa and its function. We begin our discussion with the bones of the skull.

1-1. Bones of the Skull

As a dental specialist, your main concern with anatomy involves those bones and bony landmarks that most closely relate to the teeth. While we discuss all the bones of the skull, we do place special emphasis on the maxilla (upper jaw) and mandible (lower jaw), since they are the bones that contain the teeth.

200. Name, locate, and identify the facial and cranial bones of the skull that do not directly support the teeth.

The skull is composed of 22 flattened or irregular bones. With one exception (the mandible), they are immovably joined together. The bones of the skull are divided into two groups: the cerebral cranial bones, which enclose and protect the brain, and the facial bones, which make up the skeleton of the face. There are eight cerebral cranial bones and 14 facial cranial bones. All 22 bones are shown in foldout 1, located in the back of this volume. Only the facial bones are discussed in detail.

Cranial Bones of the Skull. Cranial bones are either single or paired. Single bones are always found in the midline plane of the skull. Paired bones are found on either side of this plane and are mirror images of each other. There are eight cerebral cranial bones: the frontal (single), parietal (paired), occipital (single), temporal (paired), sphenoid (single), and ethmoid (single).

Frontal. The frontal forms the forehead, the anterior part of the floor of the cranium, the roof of the eye sockets, and the nasal cavity. Inside the heavy roll of bone above the eye and posterior to the eyebrows are two airspaces called the frontal sinuses. These sinuses drain into the nose. Their purpose is thought to be that of maintaining even temperature ranges within the bone.

Parietal. The two parietal bones form the roof and the upper sides of the cranium. These bones extend from the frontal bone to the occipital bone. The sagittal suture is formed where the two bones meet at the top of the cranium. From this suture, the parietal bones extend outward and downward to a point at about the top of the external ear, where they meet the temporal bones.

Occipital. The occipital bone forms the back and the base of the skull. It is commonly referred to as the back of the head. This is the bone that supports the head upon the spinal column. When a patient is properly seated in the dental chair, the headrest should be positioned to support the occipital bone. If this is done properly, the entire head will be supported. The spinal cord passes through a large hole in the base of the occipital bone to the vertebral canal. This large hole is called the foramen magnum.

Temporal. The two temporal bones form the lower part of each side and a part of the base of the cranium. These bones contain the essential organs of hearing and balance. The zygomatic process of each temporal bone extends forward from the top of the external opening of the ear to join the zygomatic bone of the face. This process forms a part of the zygomatic arch or cheek bone.

Sphenoid. The sphenoid bone makes up part of the floor of the cranial cavity. It also forms the posterior one-third of the lateral walls of the nasal cavity and the back of the orbits, permitting the transmission of the optic nerve from the brain. The sphenoid bone also contains sinuses which drain into the nose.

Ethmoid. The ethmoid bone is located between the eyes and extends from the roof of the nose and sphenoid bone to the frontal bone. It forms the anterior part of the skull base, the medial wall of both eye sockets, and the roof of the nasal cavity. The olfactory nerves to the nose are transmitted through the ethmoid bone. The ethmoid sinuses are located in this bone and they, too, drain into the nose.

The Face. Since the face lies within the area with which the dentist is concerned, let's look at its structure. Its importance is paramount in that it affects appearance and expression, and it is the gateway to the alimentary canal. Damage to the face can result in serious social and psychological problems. The 14 facial bones complete the anatomy of the skull. Included in these are two maxillary, two zygoma, two nasal, two lacrimal, one vomer, two inferior conchae, two palatine, and one mandible. Since the bones of the jaws—the maxilla and mandible—are of special interest, we will discuss them last and in more detail.

Zygoma. The *zygomatic bones* form the lower and outer edge of the eye sockets and the prominent portion of the cheekbone. The anterior edge of the zygomatic bone joins the maxilla and is called the zygomatic process of the maxilla.

Lacrimal. The *lacrimal bones* are small fragile bones of the face. They are situated at the front of the medial wall of the eye orbits. They contain part of the canal through which the tear ducts pass.

Nasal. The *nasal bones* are two small, thin, oblong, bones located side by side at the middle and upper part of the face. These bones, by their junction, form the upper part of the bridge of the nose. The lower part of the nose is formed by nasal cartilages.

Inferior conchae. The *inferior conchae* are curved bones lying horizontally along the lateral walls of the nasal cavity. These bones are located directly above the roof of the mouth. Each bone is a layer of thin, cancellous tissue curled like a scroll.

Palatine. The *palatine bones* are situated at the back part of the nasal cavity between the maxilla and the pterygoid process of the sphenoid. They are L-shaped; the horizontal part helps to form the floor of the nasal cavity and the roof of the mouth; the vertical part extends to the orbit and forms a very small portion of the orbit's floor.

Vomer. The *vomer* is a single bone located at the lower and back part of the nasal cavity, and it forms part of the septum of the nasal cavity. It is thin and varies in individuals. Frequently, it is bent to one side or the other, thus making the nasal chambers of different size.

Exercises (200):

Display your ability to name, locate, and identify the bones of the skull by matching the descriptive statements in column B to the elements listed in column A.

Column A

____ 1. 22.
____ 2. Zygoma.
____ 3. Vomer.
____ 4. Ethmoid.
____ 5. 14.
____ 6. Inferior conchae.
____ 7. Palatine.
____ 8. Parietal.
____ 9. Sphenoid.
____ 10. Lacrimal.
____ 11. Temporal.
____ 12. Frontal.
____ 13. Nasal.
____ 14. Occipital.

Column B

a. Total number of facial bones.
b. Paired bones that form the roof and upper sides of the cranium and contain the sagittal suture.
c. Paired bones that form the lower part of each side and a part of the base of the cranium. They also contain the essential organs of hearing and balance.
d. Total number of bones in the skull.
e. Paired bones that form the lower and outer edges of the eye socket and the prominent portion of the cheekbones.
f. These paired bones by their junction form the upper part of the bridge of the nose.
g. This bone forms the back and base of the skull and contains the foramen magnum.
h. This bone forms the forehead and contains sinuses that drain into the nose.
i. Situated at the front of the medial wall of the eye orbits, these small fragile bones contain part of the canal through which tear ducts pass.
j. The horizontal portion of these bones play a major role in forming the roof of the mouth.
k. This bone is located between the eyes, and it extends from the roof of the nose and sphenoid bone to the frontal bone.
l. These curved, scroll-like bones are located along the lateral walls of the nasal cavity.
m. This bone makes up part of the floor of the cranial cavity and also forms the posterior one-third of the lateral walls of the nasal cavity and the back of the orbits.

Column B

n. This single bone forms part of the septum of the nasal cavity. Frequently, it is bent to one side, making nasal chambers of different sizes.

201. Describe, locate, and identify the anatomical features of the maxilla and mandible.

The Maxilla and Mandible. As stated earlier, the maxilla and mandible are of special interest to the dental profession, since they are the bones in which the teeth are embedded. For this reason, we have elected to discuss them in more detail than we did the other facial bones.

Maxilla. The maxillae (plural) form the upper jaw. They are two irregular-shaped bones that contribute to the formation of the boundaries of the roof of the mouth, the floor and outer walls of the nasal cavity, and the floor of each orbit. Within the thin walls of each maxilla is the maxillary sinus. Each maxilla consists of a body and four processes. The body of the maxilla is the base for these processes and gives shape to the face in general. The four processes and their purposes are as follows:

- The frontal processes give shape to the nose.
- The zygomatic processes join the zygomatic bones and form the cheeks just below the orbits.
- The alveolar processes hold and support the maxillary teeth.
- The palatal processes join to form most of the hard palate.

The body and the four processes are shown in figure 1-1. During this discussion, you should refer to this figure frequently.

The *alveolar processes* are the ones with which you will most often come into contact. These processes are extensions of the lower maxillae body surfaces. They fuse together between the central incisors and appear as one process—the maxillary alveolar process. The function of this maxillary process is to hold and support the maxillary teeth. However, when the teeth are removed, this holding function is no longer necessary. Then the body, through natural resorption, removes a large portion of the structure. For this reason, the dentist tries to maintain the natural teeth as long as possible. The anatomy of the maxillae is particularly important to the dental profession, especially in prosthetic dentistry and roentgenology. Of particular interest to prosthetic dentistry is the maxillary tuberosity, the small, rough prominence behind each maxillary third molar area. Just behind the maxillary tuberosity, where the maxilla and the pterygoid process unite, is a notch or groove known as the hamular notch. This notch is used to determine the posterior extent of a maxillary denture.

There are three paired *foramina* and one unpaired foramen in each maxilla. These foramina allow blood vessels and nerves to pass in and out of the maxilla. The unpaired foramen lies just posterior to the central incisors at the midline of the hard palate. It is called the incisal foramen or the incisive palatine foramen. One set of the paired foramina lie medial to the third molars at the suture line of the palatal processes of the maxillary and the palatine bones. They are called the major palatine foramina or the posterior palatine foramina. The

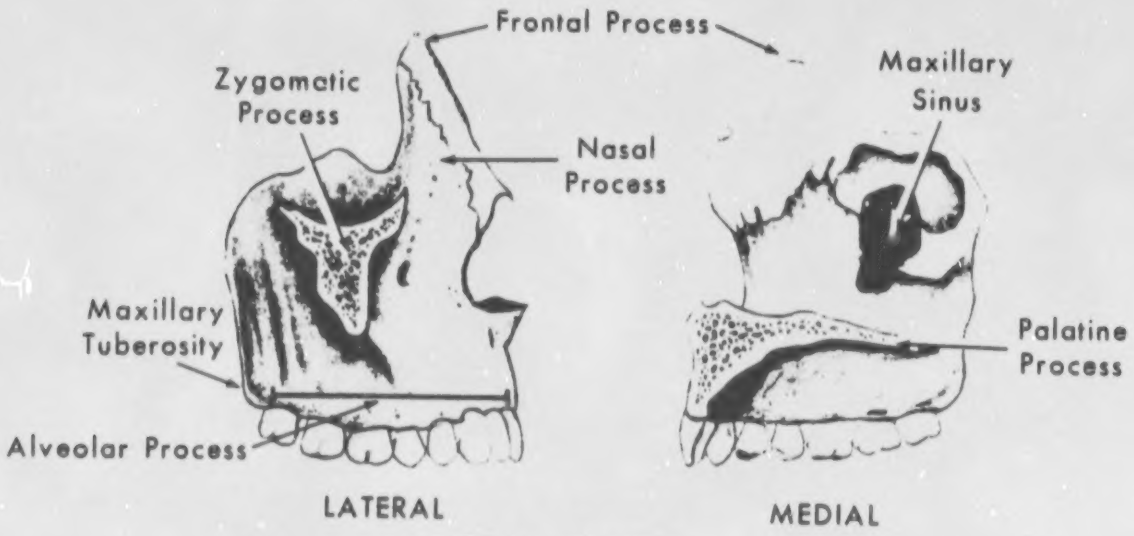


Figure 1-1. The maxilla.

second group of paired foramina are found on the distal border of the maxillary tuberosity. Usually, they consist of three to five openings and are called the posterior superior alveolar foramina. The last group of paired foramina are located on the zygomatic process of the maxillary bone, superior to the apex of the cuspids, and just below the eye orbit ring. These foramina are called the infraorbital foramina.

Mandible. The mandible forms the lower jaw. It is the largest and the only movable bone in the skull. The mandible consists of a body, two rami, and the mandibular alveolar process.

The body of the mandible is a strong, hard piece of bone that curves somewhat like a horseshoe. At the posterior of the mandible, the bone turns upward and slightly backward to form the rami. The alveolar process is on the superior border of the body of the mandible. Figure 1-2 shows the mandible and the anatomy important to you as a

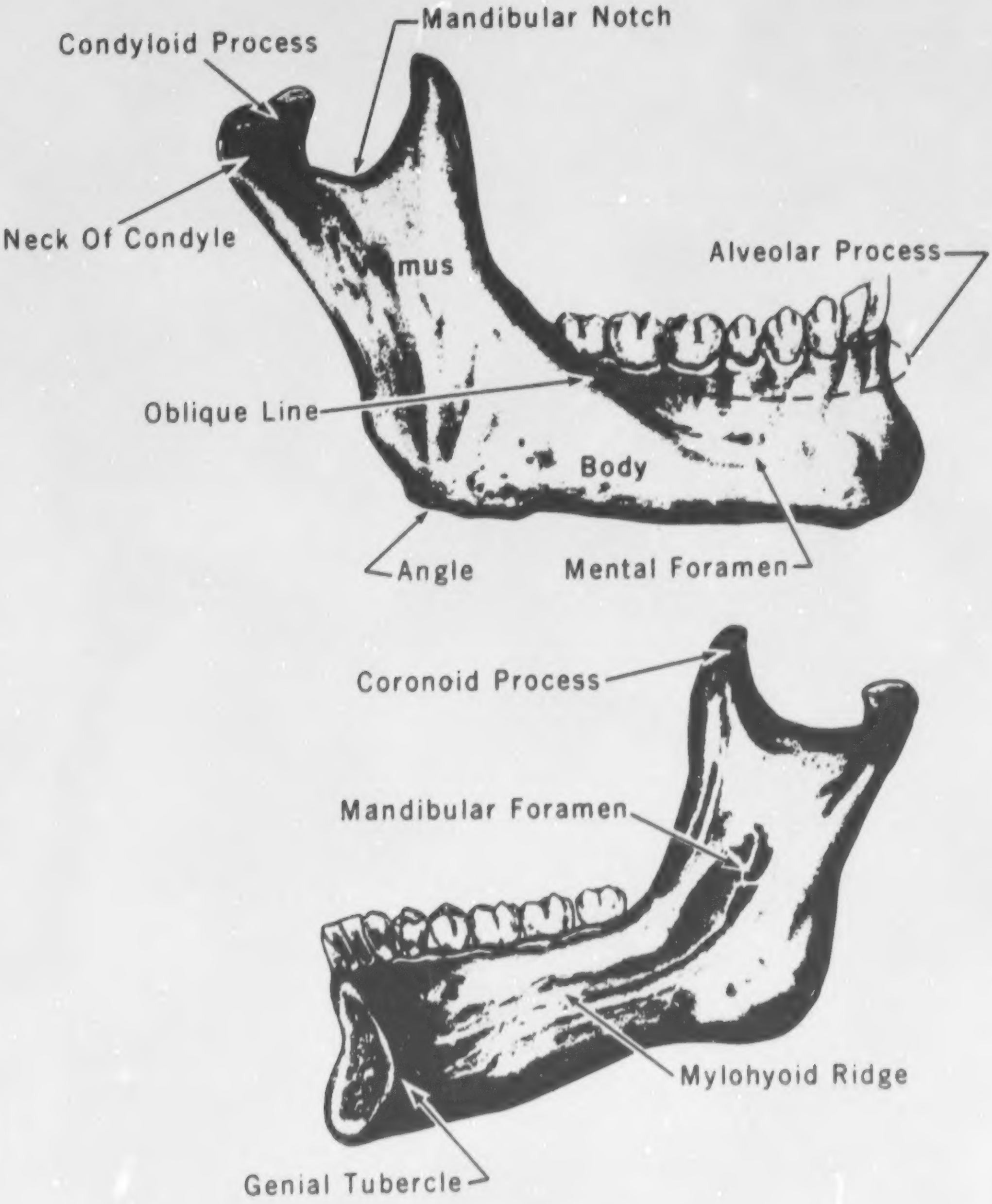

Mandibular Notch
Condyloid Process
Neck Of Condyle
mus
Alveolar Process
Oblique Line
Body
Angle
Mental Foramen
Coronoid Process
Mandibular Foramen
Mylohyoid Ridge
Genial Tubercle

Figure 1-2. The mandible.

dental technician. Therefore, during this discussion of the mandible you should make frequent references to the figure.

On each side of the mandible, approximately 2 inches distal from the midline and on the lateral surfaces of the mandible, are the mental foramina. They are located about halfway between the top and bottom edges of the mandible. Their function is to allow blood vessels and nerves to exit to the soft tissues of the chin. On the internal surface of the mandible, opposite the chin and on the midline, is the genial tubercle or mental spine. These are sharp spines that serve as attachments for the genioglossus muscle. These tubercles are used as landmarks in dental roentgenology. The bony ridge that starts just below the genial tubercules and extends backward and upward on each inner side of the mandible, ending in the area of the third molar, is known as mylohyoid ridge. This serves as an attachment for the mylohyoid muscle that forms the floor of the mouth. On the external surface of the mandible is the oblique line. This line starts near the mental foramina and extends upward and backward until it disappears into the anterior edge of the ramus. These landmarks are used in prosthetic dentistry. The dental officer insures that he does not overextend his impression, which would cause the denture to impinge on the tissue, thus causing an irritation or a denture that does not properly seat.

The rami are the vertical extensions of the mandible. The posterior of the ramus and the lower border of the body of the mandible meet at what is called the angle of the mandible. The front edge of the ramus meets the body and forms the retromolar triangle. This junction is located just behind the last tooth. The ramus divides into a "Y" at the top to form the coronoid and condyloid processes. The anterior part, or coronoid process, serves as an attachment for muscles of mastication. The posterior process, or condyloid process, has a knob on top called the head. This head fits into a depression in the temporal bone to form the temporomandibular joint. The space between the coronoid and condyloid processes is the mandibular notch. The mandibular foramina are located almost in the center of the inside surface of the rami. Through these foramina, the blood vessels and nerves enter and leave the mandibular body. These foramina are protected superiorly by a bony ridge called the lingula.

The alveolar process of the mandible is of the same type of bone structure and serves the same function as that of the maxillary alveolar process. In an X-ray film view of the posterior teeth, the oblique line superimposed over the alveolar process gives the impression that this portion of the process is much thicker. Behind the last tooth, the alveolar process becomes continuous with the ramus in the retromolar area.

Exercises (201):

1. What anatomical formations are contributed to by the maxillae?

Describe the function or anatomical formation of the processes of the maxilla by matching the function or formation in column B to the process in column A.

Column A	*Column B*
___ 2. Palatal.	a. Holds and supports the maxillary teeth.
___ 3. Zygomatic.	b. Forms most of the hard palate.
___ 4. Alveolar.	c. Gives shape to the nose.
___ 5. Frontal.	d. Forms the cheeks just below the orbits.

6. Describe and tell where the maxillary tuberosity is located.

7. What notch or groove is located just behind the maxillary tuberosity, where the maxilla and the pterygoid process unite?

8. What is the purpose of the foramina located in the maxilla?

Indicate the anatomical position of the foramina located in the maxilla by matching the location given in column B to the foramen or foramina in column A.

Column A	*Column B*
___ 9. Incisive palatine foramen.	a. On the zygomatic process of the maxillary bone, superior to the apex of the cuspids, and just below the eye orbit ring.
___ 10. Major palatine foramen.	b. On the distal border of the maxillary tuberosity.
___ 11. Infraorbital foramen.	c. Medial to the third molars at the suture line of the palatal processes of the maxilla and the palatine bones.
___ 12. Posterior superior alveolar foramen.	d. Posterior to the central incisors at the midline of the hard palate.

13. What is the only movable bone of the skull?

14. Where is the alveolar process of the mandible located?

TABLE 1-1
MUSCLES OF MASTICATION

Muscle	*Origin*	*Insertion*	*Action*
Temporalis	Side of head	Coronoid process.	To raise the mandible and close the mouth.
Masseter	Zygomatic process	Facial surface of the angle of the mandible.	To raise the mandible and close the mouth.
Medial pterygoid	Sphenoid bone	Lingual surface of the angle of the mandible.	The simultaneous action of both medial pterygoid muscles moves the mandible upward and forward. When one medial pterygoid contracts, it moves the mandible to the side opposite that muscle.
Lateral pterygoid	Sphenoid bone	Condyloid process of the mandible.	The simultaneous action of both lateral pterygoid muscles moves the mandible downward and forward. When one lateral pterygoid contracts, it moves the mandible forward and to the side opposite that muscle.

15. What anatomical feature is located on each side of the mandible approximately 2 inches distal from the midline about halfway on the mandible lateral surface? What is the function of this feature?

16. Where is the genial tubercle located, and for what does it serve as an attachment?

17. Describe the path of the mylohyoid ridge, and state what attaches to this ridge.

18. What is the vertical extension of the mandible called?

19. What is the anterior process at the top of the rami called? What purpose does it serve?

20. What joint is formed when the head of the condyloid process fits into the depression in the temporal bone?

21. What is the space between the coronoid and condyloid processes called?

22. Where is the retromolar area located?

1-2. Muscles of Mastication and Temporomandibular Articulation

Now that you have an understanding of the bones of the skull, with particular emphasis placed on the maxillae and mandible, it is necessary to review the muscles of mastication and how they effect the movements of the mandible. There are four primary muscles of mastication. Table 1-1 identifies these muscles and states their origin, insertion, and action.

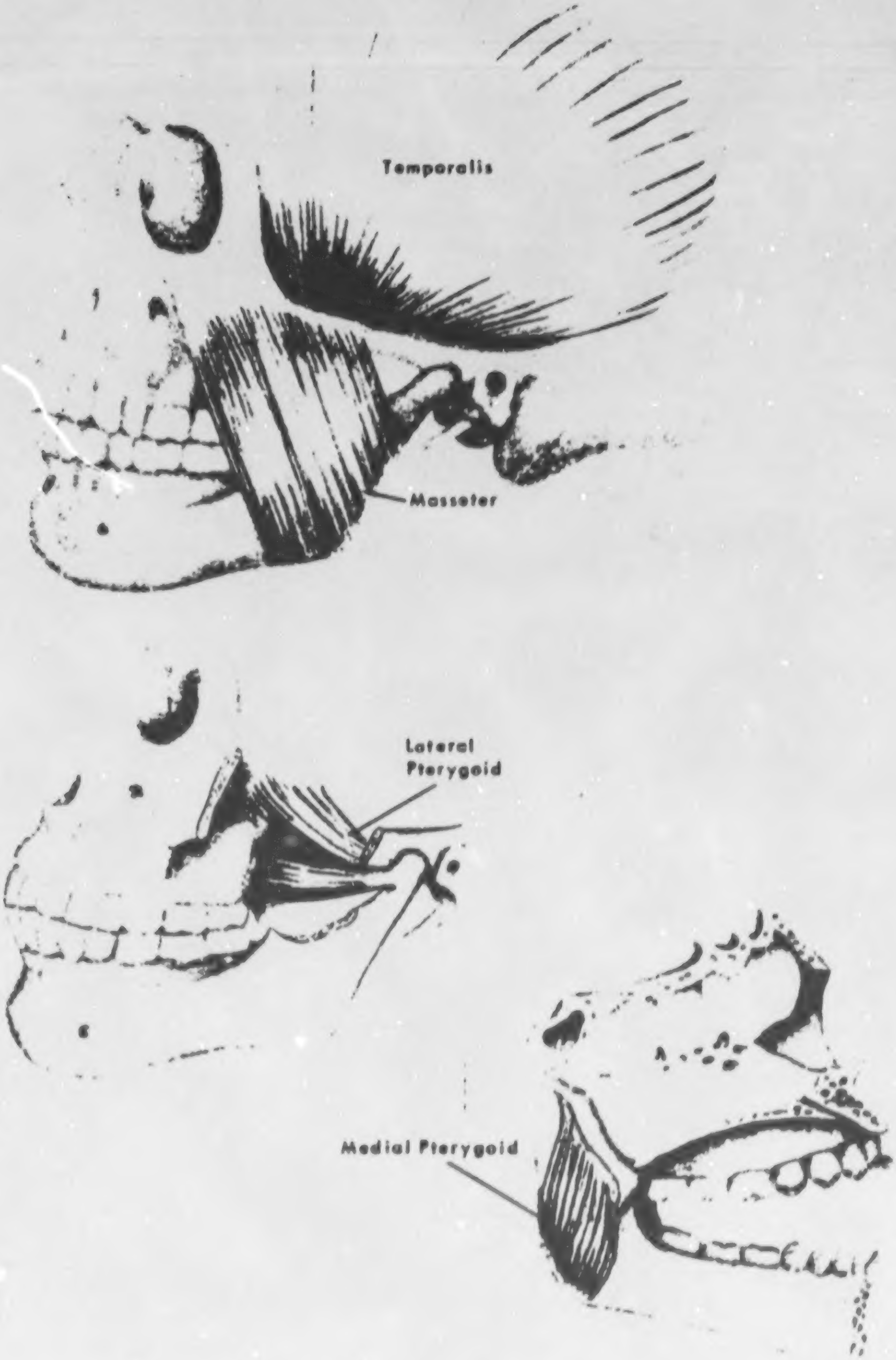

Temporalis
Masseter
Lateral Pterygoid
Medial Pterygoid

Figure 1-3. Muscles of mastication.

202. Identify the functions, location, origin, and insertion of muscles of mastication.

Prior to studying these muscles, there are a few terms that you must remember. These terms are listed below.

a. Mastication—The grinding and crushing of food with the teeth.

b. Muscle origin—The more fixed, central, or larger attachment of a muscle.

c. Muscle insertion—The part of the muscle that attaches to the bone to be moved.

Masseter Muscle. The *masseter* muscle is the most powerful mastication muscle. It acts to raise the lower jaw, thereby exerting pressure on the teeth, particularly in the posterior region. Figure 1-3 shows that its origin is the entire length of the outer surface of the zygomatic process of the maxilla and zygomatic bone. From this origin, the muscle fibers have a general downward and backward direction to their insertion on the lower border of the ramus, mandible, and facial surface of the ramus. If you will clench your teeth, you can feel the movement of the masseter muscle around the angle of the mandible.

Temporalis Muscle. The *temporalis* is a muscle whose origin is a wide area on the side of the head. This area includes the lower part of the parietal bone, the greater part of the temporal bone, the outer wing of the sphenoid bone, and the lateral surface of the frontal bone. The area of insertion of this muscle is on the entire coronoid process and part of the anterior border of the mandible. The origin and insertion can be seen in figure 1-3. The fibers of the temporal muscles are quite long and spread over a large area. For this reason, the temporalis is mainly used for movement rather than power. Thus, it is used to raise the mandible; and because of the oblique direction of the fibers, it can also retract the mandible. If you place your hand over the temporal bone, you can feel the action of this muscle when you open and close your mouth.

Medial Pterygoid Muscle. The medial pterygoid, as seen in figure 1-3, acts, in a way, as a counterpart of the masseter muscle. Its fibers follow the same general planes, and its function of raising the mandible is the same. It is located on the medial side of the ramus, with its origin being the medial surface of the lateral pterygoid plate. Its insertion is at the angular portion of the mandible.

Lateral Pterygoid Muscle. The lateral pterygoid is seen in figure 1-3. It has its origin from two separate heads: the superior head arises from the lower part of the lateral surface of the great wing of the sphenoid, and the inferior head from the lateral surface of the lateral pterygoid plate. The fibers from both heads converge in front of the temporomandibular joint and on the neck of the condyle. The action of the lateral pterygoid pulls the head of the mandible forward and inward. Thus, you can visualize the primary function of this muscle as one of grinding.

Auxiliary Muscles of Mastication. In addition to these primary muscles of mastication, there are several additional muscles that assist in the chewing of food and the formation of the lips, cheeks, and the floor of the mouth. These muscles, which can be seen in figure 1-4, never act independently but always in unison with their related muscles.

Buccinator. The buccinator muscle must be considered in any discussion of the muscles of

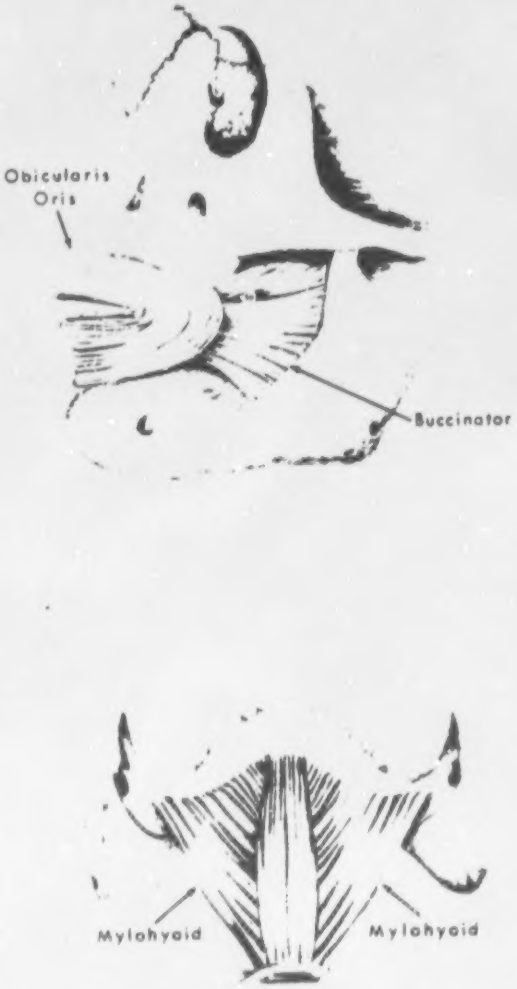


Figure 1-4. Auxiliary muscles of mastication.

mastication, although it has little, if any, effect on the movement of the mandible. The buccinator forms the lateral walls of the mouth. Its primary action is to compress the cheeks; thus, it keeps the food between the teeth during mastication. Its origin is the alveolar processes of both the maxillae and mandible. The fibers are directed forward to the angle of the mouth where they blend with the orbicularis oris. The fibers divide at the angle of the mouth so that the upper fibers insert into the muscles of the lower lip, and the lower fibers insert into the muscles of the upper lip.

Orbicularis oris. The orbicularis oris is a sphincter muscle, which has no definite origin or insertion. It completely encircles the outer entrance of the mouth and forms the fleshy portion of the lips. It functions to perform the actions of opening and closing the outer entrance of the mouth and the protrusion of the lips.

Mylohyoid. The *mylohyoid* muscle has its origin on the mylohyoid ridge. Its posterior fibers are directed downward and medially, with their insertion on the superior border of the hyoid bone. The middle and anterior fibers are united along the midline with the same fibers of the opposite mylohyoid muscle. Thus, they form the muscular floor of the mouth.

Exercises (202):

Complete the following exercise by matching the muscles in column B to the appropriate statements in column A. Some muscles can be matched to more than one statement.

Column A

____ 1. A sphincter muscle that forms the fleshy portions of the lips.

____ 2. Inserts on the hyoid bone and forms the floor of the mouth.

____ 3. Acts to raise the lower jaw; in so doing, it exerts pressure in the posterior region.

____ 4. Its long fibers are used mainly for movement rather than power; it aids in raising the mandible but can also retract it.

____ 5. Forms the lateral walls of the mouth.

____ 6. Acts as a counterpart of the masseter muscle in the function of raising the mandible.

____ 7. Has origin along entire length of outer surface of zygomatic process of the maxilla and zygomatic bone.

____ 8. Primary action is to compress the cheeks, thereby keeping food between the teeth during mastication.

____ 9. Primary action is one of grinding, since it pulls the head of the mandible forward and inward.

Column B

a. Orbicularis oris.
b. Masseter.
c. Temporalis.
d. Mylohyoid.
e. Buccinator.
f. Medial pterygoid.
g. Lateral pterygoid.

203. Given a series of statements that describe the anatomical features of temporomandibular articulation and their functions, indicate which are true and which are false.

Temporomandibular Articulation. Now that you have an understanding of the primary muscles of mastication and those other major muscles that support the mastication process, let us discuss the rotational center of the mandible—the temporomandibular joint. This joint derives its name from the two bones that enter into its makeup—the condylar process of the mandible and the mandibular fossa of the temporal bone. The mandibular fossa is somewhat cup-shaped and is limited anteriorly by the articular eminence. This aids the ligaments of the joint in keeping the jaw from becoming dislocated. The articular surface of the condyle is oblong with the long diameter in a transverse plane. This joint allows for a combination of movements such as hinge, bilateral, and protusive. To prevent the bony surfaces of the two principal bones in this joint from rubbing and wearing their surfaces, an articular disk lies between the condyle and the mandibular fossa. The upper surface of the thin, oval, fibrocartilage plate is convex to conform to the mandibular fossa. The undersurface is concave to conform to the head of the condyle. On its circumference, the articular disk is connected to the articular capsule or capsular ligament and, in front, to the lateral pterygoid muscle. The disk divides the joint into two cavities. Each of these cavities has a synovial membrane surrounding it, which secretes a fluid that acts as a lubricant for the joint. To seal in this lubricant, the joint is enclosed in the capsular ligament. This protects the joint linings from wear and allows the temporomandibular joint to absorb normal blows to the jaw. The four ligaments in the temporomandibular joint help prevent excessive movement and aid in supporting the mandible. Individually, they are the capsular, temporomandibular, sphenomandibular, and the stylomandibular ligaments. Refer to figure 1-5 as we discuss each of these.

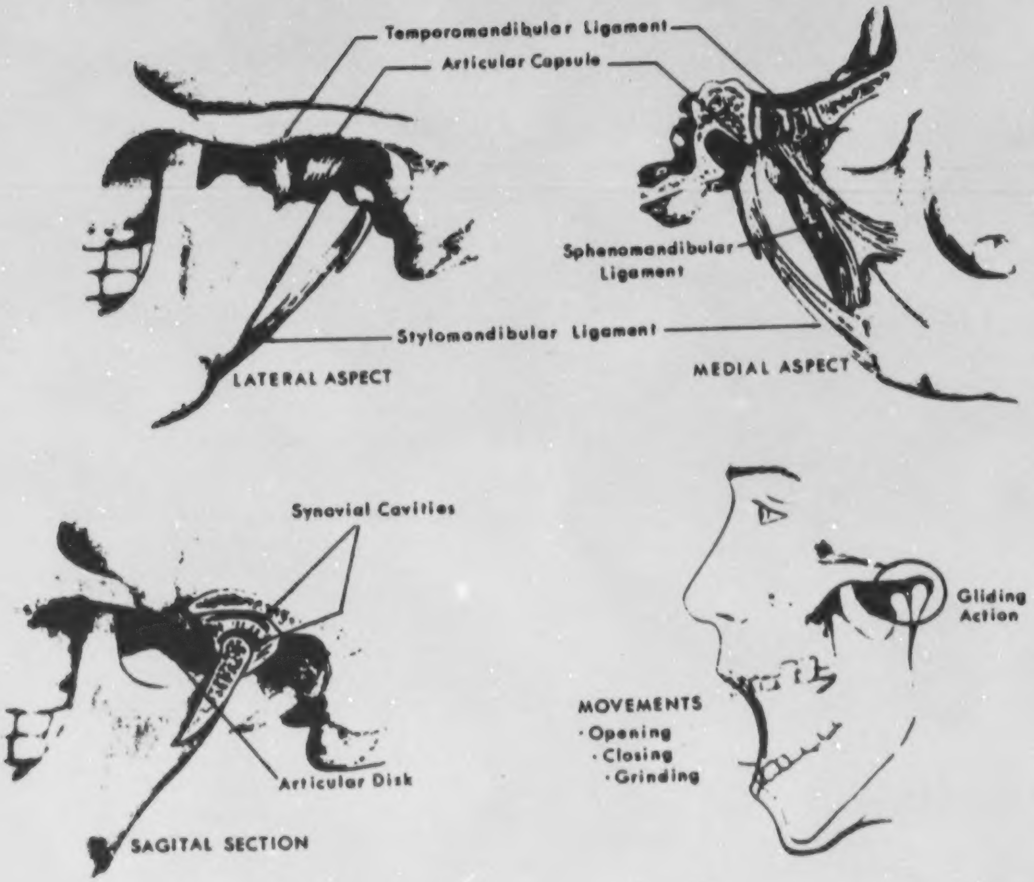

Temporomandibular Ligament
Articular Capsule
Sphenomandibular Ligament
Stylomandibular Ligament
LATERAL ASPECT
MEDIAL ASPECT
Synovial Cavities
Articular Disk
SAGITAL SECTION
Gliding Action
MOVEMENTS
·Opening
·Closing
·Grinding

Figure 1-5. The temporomandibular joint.

a. The *capsular ligament* is often called the articular capsule. It is a thin, sheetlike ligament that surrounds the temporomandibular joint and attaches to the temporal bone above and to the neck of the condyle below.

b. The *temporomandibular ligament* attaches above to the zygomatic process of the temporal bone and extends downward to attach to the outer and posterior surface of the neck of the condyle.

c. The *sphenomandibular ligament* is a flat, thin band that attaches above to a projection on the under surface of the sphenoid bone. It then passes downward and attaches to the inner surface of the ramus in the region of the mandibular foramen.

d. The *stylomandibular ligament* attaches near the end of the styloid process. It then passes downward and forward and attaches to the posterior border of the mandibular angle.

Exercises (203):

Complete the following exercises by indicating whether the statements concerning temporomandibular articulation are true (T) or false (F).

___ 1. The temporomandibular joint derives its name from the two bones that enter into its makeup: the condylar process of the mandible and the mandibular fossa of the temporal bone.

___ 2. The articular eminence aids the ligaments of the joint in keeping the jaw from becoming dislocated.

___ 3. The temporomandibular joint allows only for a hinge-type movement.

___ 4. The articular disk divides the joint into three cavities.

___ 5. The four ligaments in the temporomandibular joint help prevent excess movement and aid in supporting the mandible.

___ 6. The four ligaments involved in temporomandibular articulation are the condyloid, temporomandibular, sphenomandibular, and mylomandibular.

___ 7. The synovial membrane secretes a fluid that lubricates the joint.

—— 8. The articular disk lies between the condyle and the mandibular fossa.

—— 9. To seal in the lubricant, the joint is enclosed in the capsular ligament.

1-3. The Oral Cavity

It is in the oral cavity that you and the dental officer perform most of your tasks. In this section, we discuss the structure of the oral cavity. We begin our discussion with the functions and general anatomy of the oral cavity. Next, we discuss the mucous membrane. Then we cover the two major portions of the mouth, the vestibule and the mouth proper. We finish this section with the salivary glands.

204. State the functions and locate the structures of the oral cavity.

Functions and General Anatomy of the Oral Cavity. The oral cavity, or mouth, is the entrance to the alimentary canal. It is, therefore, the first subdivision of the digestive system. The oral cavity contains the elements of mastication, helps perform the functions of speech, and provides a special sense of taste. The mouth is bounded in front by the lips, laterally by the cheeks, above by the hard and soft palates, and below by the floor of the mouth. It contains the teeth and tongue. Anteriorly, the mouth opens through the lips, and posteriorly, through the fauces into the pharynx. The mouth is divided into two parts: (1) the vestibule, which lies between the lips, cheeks, and teeth; and (2) the mouth proper, which lies internally to the teeth. The bony framework of the mouth is formed by the maxilla, palatine bones, and the mandible.

The Mucous Membrane. The mucous membrane lining the mouth is continuous posteriorly with the mucous membrane of the pharynx; anteriorly it blends with the skin of the face. Many mucous glands are distributed throughout this mucous membrane. While this membrane is similar in composition to the skin, it is softer and less tough. It is made up of two layers: the epithelium and an underlying connective tissue. A loose submucosa containing many fat cells lies beneath the two layers. In addition to fat cells, the submucosa contains a series of glands to bathe the mucous membrane with serous or mucous secretions. In the hard palate, these glands are to be found at the base of the epithelial layer, since there is no submucosa on the hard palate. Healthy mucous membrane is pink in color. However, when diseased, it may vary in color from a bright red to a pale pink. Oral mucosa is divided into three types: masticatory, specialized, and lining.

Masticatory mucosa. Masticatory mucosa is tightly bound to the underlying bone, such as the hard palate and attached gingiva. A microscopic cross-section of the mucosa would reveal a thick epithelium, thick connective tissue (lamina propria), and definite rete pegs. Masticatory mucosa is stippled and tightly bound down—that is, upon application of pressure there is no indication of elastic fibers that permit tissue to stretch or expand, and the tissue is obviously keratinized (of a hornlike composition).

Specialized mucosa. Mucosa that has been developed for the purpose of taste perception is called specialized mucosa. There are four divisions of specialized mucosa: the filiform, the fungiform, the foliate, and the circumvallate.

a. The filiform are thread-shaped papillae on the dorsal surface of the tongue. They are the smallest and most numerous. Taste buds are located at the base of these papillae and are the main source of taste sensation.

b. Fungiform are mushroom-shaped papillae located on the tip and along the sides of the tongue. Those located on the tip of the tongue are responsible for the sensation of sweet. The fungiform located along the sides of the tongue are partially responsible for the sensation of sour.

c. Foliate papillae also are partially responsible for detecting the sensation of sour. The mucous membrane is very thin along the margins of the tongue, but on the posterior part of each margin can be found a variable number of vertical folds. These folds are collectively called foliate papillae.

d. Circumvallate papillae are large mushroom-shaped papillae located on the posterior dorsum of the tongue. These papillae are usually arranged in an inverted "V" formation, and they number from 8 to 12. These taste buds are responsible for the sensation of bitterness.

Lining mucosa. Lining mucosa is found on the floor of the mouth, the lining of the cheeks, the covering of the lips, and the soft palate. It has a thin epithelium and connective tissue. There is no stippling nor is it keratinized. This mucosa has an abundant supply of elastic fibers, thus allowing for free movement and elasticity.

The Vestibule. The vestibule is the space that is bounded above and below by the reflection of the mucous membrane from the lips and cheeks onto the gingiva of the maxillae and mandible. This reflection of tissue, which is known as the mucobuccal fold, can be seen in figure 1-6. To explore the vestibule limits, place your teeth together and push your index finger along the outer surfaces of the teeth; move your finger upward and downward as far as possible.

We must consider both the upper and the lower labial frena (singular—frenum) when discussing the vestibule. These are sickle-shaped extensions of connective tissue that connect the lips to the alveolar ridges. This connection tends to restrict the lip movement.

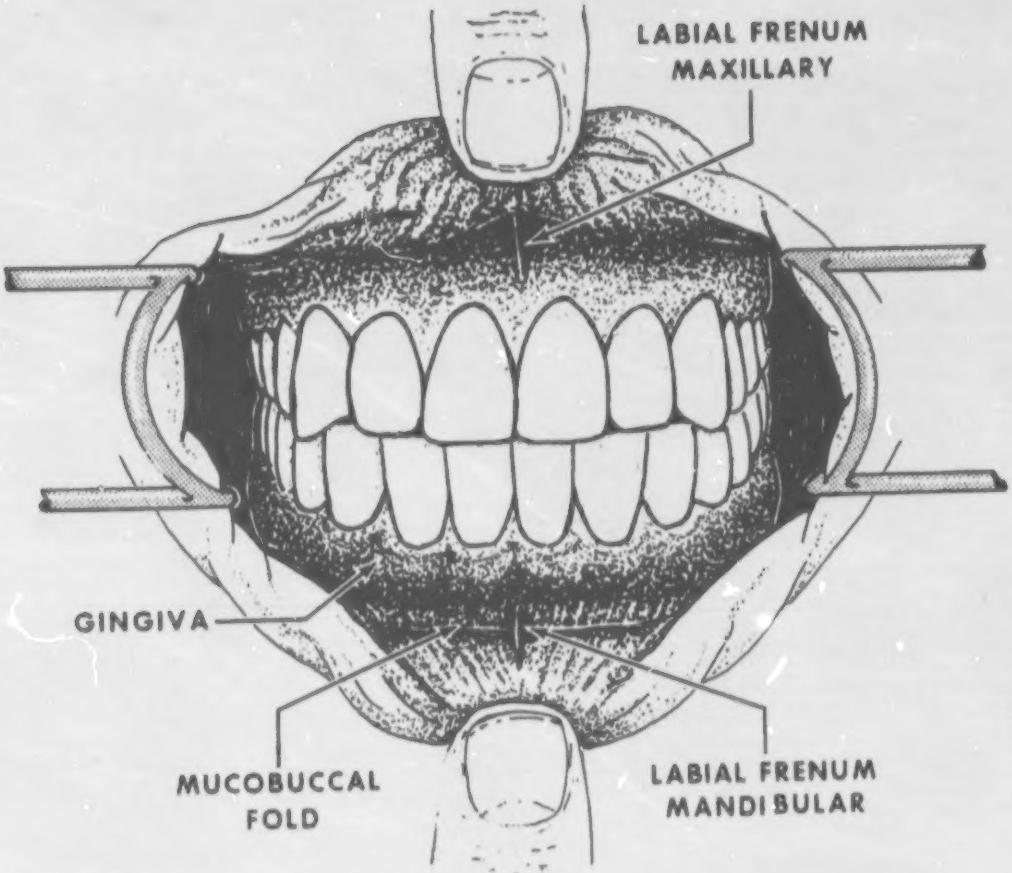


Figure 1-6. The vestibule of the mouth.

The lips are the fleshy folds of tissue around the opening of the mouth. The orbicularis oris muscle encircles the mouth and is a major contributor to the lip formation. The lip borders are the points where the mucous membrane of the oral cavity meets the skin of the face.

The cheeks are made up of muscles and fibroelastic tissue, with the outer surface covered by skin and lined internally with mucous membrane. Three pairs of masticatory muscles—the masseters and the medial and lateral pterygoids—contribute to the cheek formation. However, the buccinator muscles form the innermost muscular layer of the cheeks and force the food between the teeth from the facial side during mastication. The cheeks extend both upward and downward to the line where the mucous membrane turns back on the alveolar process.

The Mouth Proper. The mouth proper is enclosed by the teeth. Its front and side boundaries are the gingivae and the lingual surfaces of the teeth. At the back, it opens into the pharynx. The arched roof of the mouth is composed of both the hard and soft palates. The floor of the mouth is formed by the mylohyoid muscles and the tongue.

The anterior two-thirds of the arch-shaped roof of the mouth is formed by the hard palate, as shown in figure 1-7, and is referred to as the palatal area. The arch shape is formed by the palatal process of the maxilla. The hard palate is covered with a mucous membrane that adheres closely to the maxilla. The incisive papilla is located just behind the central incisor in the anterior region of the hard palate. The papilla covers the incisive palatine foramen through which the nerves and blood vessels pass. Posterior to this area, the mucosa is drawn into irregularly shaped elevations called rugae, which extend laterally from the midline. The soft palate is continuous with the hard palate. It is chiefly composed of muscles covered with mucous membrane. Behind the maxillary third molar are two landmarks: the maxillary tuberosity and the hamular notch. The conical-shaped mass of tissue that extends from the free border of the soft palate is the uvula. The uvula does not touch the surface of the tongue until a swallowing effort is made. When swallowing, the uvula—in combination with the muscles of the neck—closes off the passageway between the nasal cavity and the throat. Also, it vibrates during speaking.

The tongue almost covers the entire floor of the mouth. Only when the tip of the tongue is raised are you able to see the portion formed by the mylohyoid muscle. Too, when the tip of the tongue is in its raised position, you can see the lingual frena that connects the undersurface of the tongue to the floor of the mouth. On each side of the lingual frena are the sublingual papillae (nipple-shaped projections). The submandibular salivary glands secrete into the oral cavity through these papillae.

The tongue itself is a muscular organ covered with mucous membrane. It is divided into the tip, the body, and the root. The tip lies almost free, and the body is attached to the mandible at the side. The body is movable but to a lesser extent than the tip. If you look posteriorly along the dorsum of the tongue, you will notice that the root becomes less defined until it finally becomes continuous with the soft tissue structure of the mouth.

The muscles that control movement of the tongue are both intrinsic and extrinsic. The intrinsic muscles have both their origin and insertion in the tongue. The extrinsic muscles have their origin outside the tongue but insert into the tongue. Both the intrinsic (fig. 1-8,A) and extrinsic muscles (fig. 1-8,B) are illustrated. Use this figure in conjunction with tables 1-2 and 1-3, which show the origin, insertion, and action on the tongue of these muscles.

During the mastication process, the tongue assists in positioning the food between the teeth. After the food has been sufficiently chewed, the tongue forms it into a ball so that it can be swallowed. After eating, the tongue helps to clean the surfaces of the teeth; and, of course, without the tongue there would be no speech.

The Salivary Glands. Although not a part of the vestibule or the mouth proper, there are three pairs of major salivary glands that empty their saliva into the oral cavity. They are the parotid, the submandibular, and the sublingual. The parotid glands (which are the largest of the salivary glands) lie in the cheeks just in front of the ear. They empty their secretion into the oral cavity through the parotid or Stensen's duct. The opening of the ducts are opposite the maxillary second molars. The opening of a parotid duct is usually marked by the parotid papilla. The submandibular glands (sometimes called submaxillary glands) are located below the mandible, medial and inferior to the parotid gland. These glands discharge their

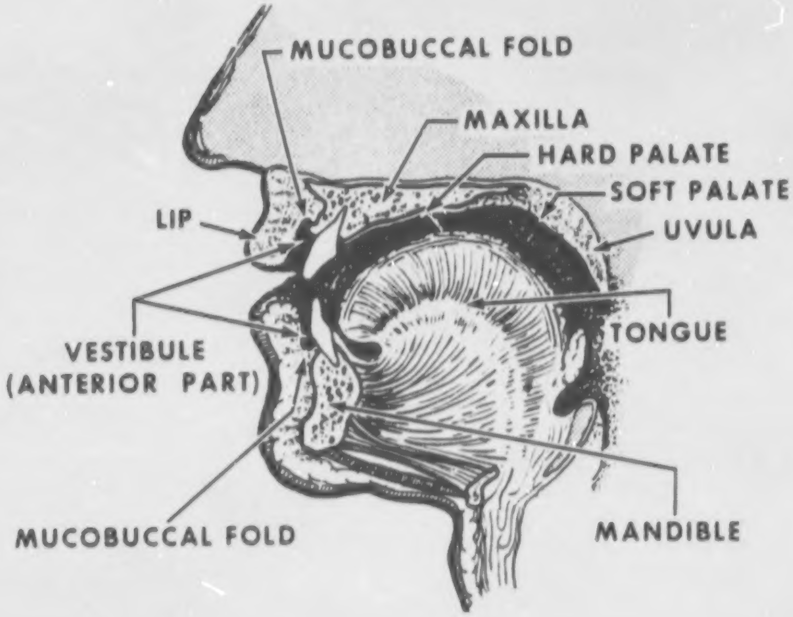


Figure 1-7. Cross-section of the oral cavity.

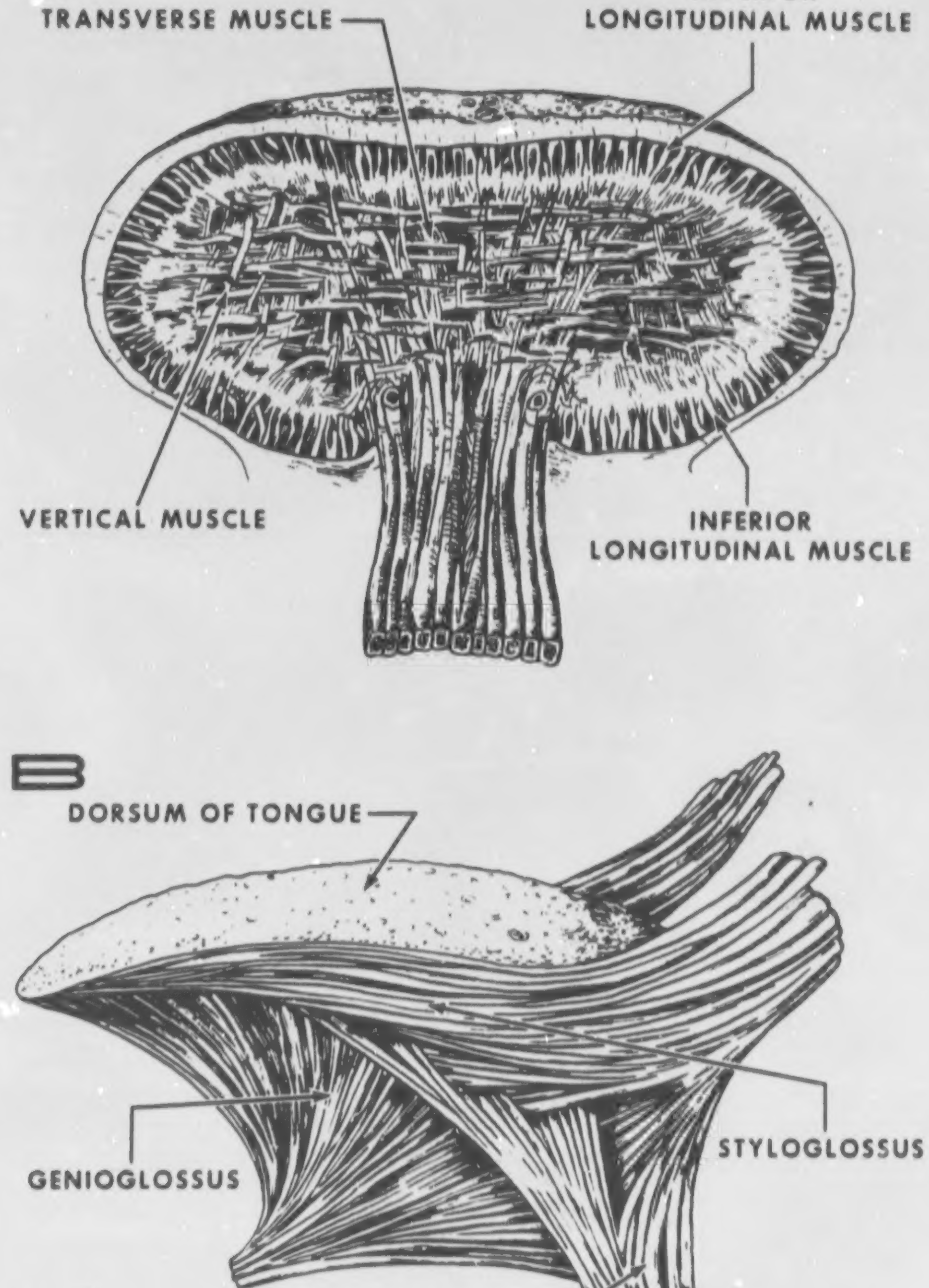

A
TRANSVERSE MUSCLE
SUPERIOR LONGITUDINAL MUSCLE
VERTICAL MUSCLE
INFERIOR LONGITUDINAL MUSCLE
B
DORSUM OF TONGUE
GENIOGLOSSUS
STYLOGLOSSUS
HYOGLOSSUS

Figure 1-8. Muscles of the tongue.

TABLE 1-2
INTRINSIC MUSCLES OF THE TONGUE

Muscle	*Origin*	*Insertion*	*Action on Tongue*
Superior longitudinal	Near the epiglottis and median septum	Runs forward to edges of the tongue.	Shortens, turns tip and edges up.
Inferior longitudinal	Root of the tongue	Tip of the tongue.	Shortens, turns tip and edges down.
Transverse	Median septum	Sides of the tongue.	Narrows and elongates.
Vertical	Upper surface	Under surface.	Flattens and broadens.

secretion through the submandibular or Wharton's ducts into the floor of the mouth on each side of the lingual frenum. The sublingual glands are located beneath the tongue. They are the smallest of the three major saliva glands. Many small sublingual ducts empty the secretions from the sublingual glands onto the floor of the mouth. Refer to figure 1-9 for the location of the major salivary glands.

Exercises (204):

In exercises 1 through 9, which follow, state the functions and locate the structures of the oral cavity by writing short answers to the following exercises in the spaces provided; or complete statements by writing appropriate words in the spaces provided.

1. What are the four functions of the oral cavity?

2. The oral cavity is divided into two parts: (1) the mouth proper and (2) the ______________ .

3. Where is the vestibule located?

4. What skull bones form the bony framework of the mouth?

5. *a.* Where in the mouth is the palate?
   b. What are its two parts?

TABLE 1-3
EXTRINSIC MUSCLES OF THE TONGUE

Muscle	*Origin*	*Insertion*	*Action on Tongue*
Genioglossus	Superior genial tubercle	Under surface of tongue from apex to root.	Protrudes and depresses.
Styloglossus	Styloid process	Posterior dorsum of the tongue.	Upward and backward.
Hyoglossus	Greater cornu and body of the hyoid	Side of the tongue.	Depresses and turns edges down.

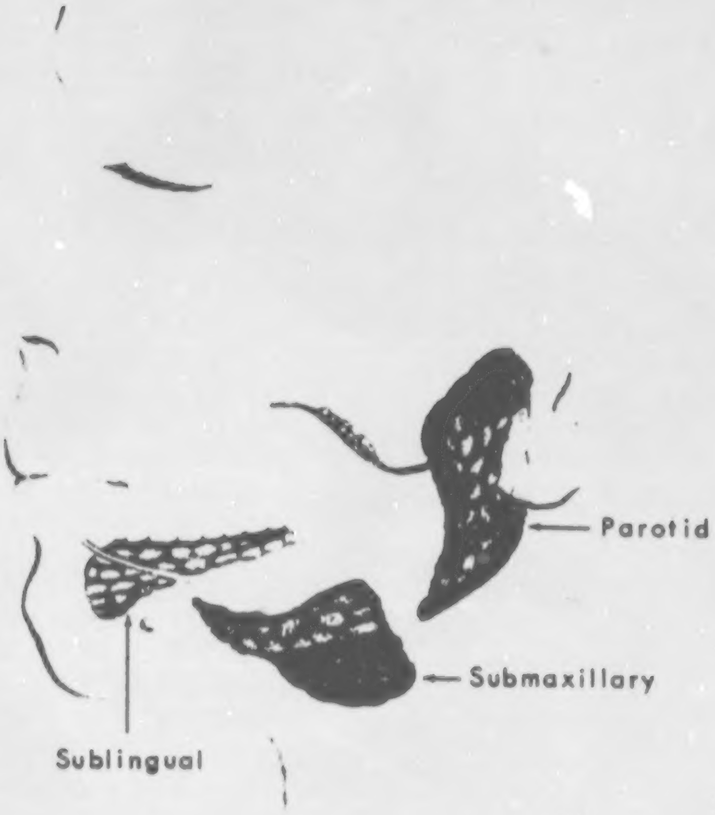


Figure 1-9. Major salivary glands.

6. What is a good way for you to differentiate between healthy and diseased mucous membrane?

7. The filiform, thread-shaped papillae, including the taste buds, are specialized mucosa located on the ________________ surface of the ____________ .

8. Specialized mucosa provide the following taste sensations:

    a. Fungiform papillae, ____________ and ____________ .

    b. Foliate papillae, ____________ .

    c. Circumvallate papillae, ____________ .

    d. Filiform papillae, ____________ .

9. What special property does an abundant supply of elastic fibers allow the lining mucosa to possess?

In exercises 10 through 14 which follow, match the terms in column A with the most appropriate statement in column B by writing the correct letter in the blank provided. A statement may be used once only or not at ali. One term may be matched twice.

Column A

___ 10. Vestibule limits.
___ 11. Labial frena.
___ 12. Floor of mouth.
___ 13. Tongue.
___ 14. Salivary glands.

Column B

a. A muscular organ covered with mucous membrane, whose movement is controlled by intrinsic and extrinsic muscles.
b. Formed by the mylohyoid muscles and the tongue.
c. Sickle-shaped extensions of connective tissue that connect the lips to the

Column B

alveolar ridges, thereby restricting lip movement.

d. Can be explored when the teeth are together by pushing index finger along the outer surface of teeth and moving finger upward and downward.

e. Used to empty secretions into mouth.

f. Not a part of the vestibule or mouth proper but are made up of the parotid, submandibular, and sublingual.

g. Conical-shaped mass of tissue that extends from free border of the soft palate.

h. Used as an aid in speech, to help clean surfaces of teeth, and in the mastication process.

i. Space bounded by reflection of the mucous membrane from lips and cheeks onto the gingiva of the maxillae and the mandible.

1-4. Nerve and Blood Systems of the Oral Cavity

As with other cells, tissues, and organs of the body, the oral cavity also has a nerve, blood, and lymph systems. In this section, we discuss the portions of these systems that are of importance to the dental specialist.

205. Locate, identify, and state the function of the nerves that innervate the oral cavity.

Innervation of the Oral Cavity. There are a total of 12 pairs of cranial nerves. Each pair originates in the brain and supplies definite areas of the body. Of these we are concerned with only two, the trigeminal and the facial. After leaving the cranium, both the trigeminal and the facial nerves split into branches and have a wide distribution.

The trigeminal nerve. The trigeminal, or fifth cranial nerve, is the main nerve supply of the oral cavity. Its major divisions are shown in foldout 2,A (in the back of this volume). Notice how, after the trigeminal nerve arises from the brain, it separates into three main divisions called the ophthalmic, the maxillary, and the mandibular.

The ophthalmic division is entirely sensory and passes forward to enter the orbital cavity. Within the orbital cavity, it subdivides into branches that supply sensation to the tissues around the eye and the adjacent parts of the nose and forehead.

The maxillary division leaves the skull through the foramen rotundum and enters the zygomatic fossa. In this fossa, it gives off the posterior superior alveolar branch. This branch innervates the third molar, the second molar, and the lingual and distofacial roots of the first molar. The remainder of the maxillary division passes forward into the orbital canal. While in the canal, two important branches—the middle superior alveolar and the anterior superior alveolar—are given off. The middle superior alveolar branch supplies innervation to the maxillary bicuspid teeth and the mesiofacial root of the first molar. The anterior superior alveolar branch serves the cuspid, the lateral incisor, and the central incisor. The last branching from the maxillary division of the trigeminal nerve is the point where it separates into three networks: the greater palatine, the lesser palatine, and the nasopalatine. All three palatine branches innervate the mucosa of the maxillary arch and the palate.

The mandibular division is a mixed nerve that has both sensory and motor functions. It supplies sensory innervation to all of the mandibular teeth, the mandibular gingiva, the inside of the cheek, and the tongue. In addition, it supplies motor impulses to all the primary muscles of mastication as well as to other muscles not a part of this discussion. It leaves the cranium through the foramen ovale where it gives off the motor branch that innervates the muscle of mastication. The sensory branches to the tongue are also given off at this point. The remainder of the nerve enters the mandibular canal and innervates the mandibular teeth.

The facial nerve. You should have an understanding of one other cranial nerve, the facial nerve, shown in foldout 2,B. This is the seventh cranial nerve, and like the mandibular branch of the trigeminal, it is a mixed nerve. It supplies motor sensation to all the muscles of facial expression and sensory sensation to the tongue. The facial nerve leaves the skull through the internal auditory meatus. The sensation of taste is supplied to the tongue by a branch of the facial nerve called the chorda tympani. However, the main trunk of the nerve innervates the muscles of facial expression. This is accomplished when the facial nerve subdivides into its five terminal branches. These branches are the temporal, zygomatic, buccal, mandibular, and cervical. Each of these provides motor sensations in the region for which the branch is named.

Exercises (205):

Locate, identify, and state the function of nerves that innervate the oral cavity by writing short answers to the following exercises or by writing one word in each space provided.

1. What is the name and oral cavity function of the fifth cranial nerve?

2. Into what three main divisions does the trigeminal nerve separate after it arises from the brain?

3. After entering the zygomatic fossa, the maxillary division gives off the posterior superior ____________________ branch to innervate the ______________ molar, the ______________ molar, and the lingual and distofacial roots of the first ______________ .

4. What nerve branch innervates the maxillary bicuspids?

5. The cuspids, the lateral ______________ , and the ____________________ incisors are innervated by the ____________________ superior alveolar branch of the trigeminal nerve.

6. Which trigeminal branch supplies motor impulses for mastication?

7. A major nerve that supplies taste sensation to the tongue and motor sensation to all the muscles of facial expression is known as the seventh cranial nerve, or __________ nerve.

8. Name the five terminal branches of the facial nerve that provide motor sensations in that region for which the branch is named.

206. Locate, identify, and state the function of the vessels associated with the blood supply of the oral cavity.

Blood System of the Oral Cavity. The circulation of blood to the oral cavity is accomplished through a network of arteries, veins, and capillaries. Through this vascular network, the tissues are nourished, and the metabolic products are eliminated. The arteries, except for the pulmonary artery, are the vessels that carry oxygenated blood to the tissues. The veins, except for the pulmonary vein, carry blood containing carbon dioxide. The capillaries are those minute vessels located between the arteries and the veins. Here the exchange of oxygen and carbon dioxide takes place.

Arterial system. The arteries carry blood from the heart to the tissues of the body. This arterial distribution is shown in foldout 3,A. The principal arteries that supply the head and neck are the common carotid arteries. These consist of both a right and a left carotid artery, ascending within the tissues of the neck. At about the level of the hyoid bone, each common carotid divides into internal and external carotids. Refer again to foldout 3,A, and locate this division. The internal carotids enter the base of the skull and supply the structures of the cranium. The external carotids, with their many branches, supply the structures on the outside of the bony cranium. The external carotids, just above their division from the common carotids, give off the lingual artery that supplies the tongue. The external maxillary arteries are given off superior to the lingual arteries and supply the soft tissues of the side of the face and nose, the lip tissues, and the muscles. At about the level of the lower part of the ear, the external carotids divide into their two main terminal branches—the internal maxillary artery and the superficial temporal artery.

The internal maxillary branch supplies the bones of the jaws and the teeth and their supporting soft tissues. This artery is divided into four branches called the inferior alveolar artery, the posterior superior alveolar artery, the descending palatine artery, and the infraorbital artery.

a. The inferior alveolar artery is the first branch given off by the internal maxillary artery. It passes downward and enters the mandible through the mandibular foramina to supply the lower teeth and the substance of the bone. The mental artery, a branch of the inferior alveolar artery, exits through the mental foramen and supplies the chin.

b. The posterior superior alveolar artery is the next branch given off. It enters the maxillary bone posterior to the roots of the upper third molar. It passes through the bone to supply the molar and bicuspid teeth, the maxillary sinus, and the gingiva.

c. The descending palatine artery enters the palate by way of the palatine foramina. This artery supplies the soft tissues of the hard palate.

d. The infraorbital artery is the last branch of the internal maxillary artery. Just prior to coming out through the infraorbital foramina onto the face, it gives off the anterior superior alveolar branch. This branch artery supplies the incisors and cuspids as well as the maxillary bone.

Venous system. The veins return the blood to the heart. They begin as small branches, which unite and thus increase in size, as shown in foldout 3,B. The venous blood from the brain and internal structures of the cranium drain into venous channels called sinuses. These sinuses then empty

207. State and describe the components of the lymph system, and list the essential functions of the system and its components.

Lymph System of the Oral Cavity. The head and neck are well supplied with a lymphatic system. The basic component parts of this system are the lymph, the lymph vessels, and the lymph nodes. Lymph is an almost colorless liquid similar in composition to blood plasma. The lymph fluid is derived from the blood plasma as it leaks into the spaces between the tissue cells. The essential functions of this system are to combat bacterial infections by transporting disease-producing organisms to the lymph nodes, to carry off excessive fluid from the body tissues, and to act as a supplement to the venous system.

The flow of lymph through the network of lymph vessels is influenced by three factors: (1) the difference in pressure at the two ends of the system; (2) the valves in the lymph vessels, which prevent backflow of the lymph; and (3) the contraction and relaxation of the muscles. The flow of the lymph is always toward the heart.

The lymph vessels resemble the veins in that they start as small vessels and have the same type of duct linings as veins. The lymph vessels collect the lymph from the tissue spaces and then unite to form larger vessels. With the increase in size, the walls become stronger until they are very similar in structure to the venous vessels. The tributaries of the right side of the head and neck drain into the right lymphatic duct, which, in turn, empties into the right subclavian vein. The tributaries from the left side of the head and neck drain into the thoracic duct, which empties into the left subclavian vein.

The lymph nodes are small, oval-shaped bodies that lie along the course of the lymph vessels. Usually, they occur in groups and act as filters to remove bacteria and other particles from the lymph system. The lymph nodes are also the origin of manufacture of lymphocytes. Figure 1-10 is a diagrammatic illustration showing the lymph system of the head and neck.

Exercises (207):

1. What are the components of the lymphatic system?

2. Briefly describe lymph.

3. List the essential functions of the lymph system.

4. In what direction does lymph always flow?

5. Briefly describe the lymph vessels.

6. Briefly describe the lymph nodes and their function.

1-5. Human Dentition

You must become familiar with the terms generally used in describing the external appearance of the teeth. You will use this knowledge when completing dental records and other related forms. You should realize that the characteristic shape, size, and arrangement of the teeth are factors enabling them to efficiently perform their three major functions—that is, mastication, speaking, and esthetics. You must keep in mind that while this discussion covers the normal conditions, each patient's mouth may vary from the norm.

208. Given a series of statements concerning the arches and the surfaces of the teeth, determine which are true and which are false.

The Teeth. Normally, each person gets two sets of teeth during his lifetime. The first, or deciduous set, consists of 20 teeth. The second, or permanent set, usually consists of 32 teeth. With the mouth open, the teeth are seen to be arranged in two opposing arches. The teeth in the upper arch are called maxillary teeth, and those in the lower arch are called mandibular teeth. Each tooth also has five surfaces, and each surface is named according to the direction it faces.

Divisions of the arches. As has already been stated, the teeth are embedded into the two opposing jaws, the maxilla and the mandible. Since the arrangement of the teeth in these bones resembles an arch, the teeth form the maxillary and mandibular arches.

In addition to being located in either the maxilla or the mandible, the teeth can also be located in one of four quadrants. To divide the two arches into quadrants, draw a vertical line between the two front teeth and extend it backward until it divides each arch into halves. The two quadrants in each arch are mirror images of each other and conform to the right and left sides of the body.

into the internal jugular vein. The venous blood is returned from the oral and facial structures by two principal vessels. The superficial tissues are drained by the anterior facial vein, and the deep facial tissues are drained by the posterior facial vein.

The anterior facial vein follows the same general course as the external maxillary artery. It runs at an angle downward and backward across the border of the mandible to a point at the anterior border of the masseter muscle. At this point, the anterior facial vein and the posterior facial vein unite to form the common facial vein. The common facial vein, in turn, empties into the internal jugular vein.

The pterygoid venous plexus is a mass of veins constituting a dense network around and between the lateral pterygoid muscle and the temporal muscle. The plexus receives blood from veins draining the areas supplied by the internal maxillary artery branches. The blood is led away from the plexus by a short, wide trunk known as the internal maxillary vein. The internal maxillary vein connects with the posterior facial vein which, in turn, becomes the external jugular vein. Study foldout 3,B, closely so that you will be thoroughly familiar with the location of these veins.

Exercises (206):

In the following exercises, locate, identify, or complete a functional statement concerning vessels that carry blood to or from the oral cavity by writing the appropriate missing word in the blanks provided.

1. With one exception, vessels that carry oxygenated blood from the heart to the tissue are called __________ .

2. With one exception, vessels that carry blood containing carbon dioxide are called __________ .

3. The "exceptions" in exercises 1 and 2 are the __________ arteries and veins.

4. The exchange of oxygen and carbon dioxide takes place in those minute vessels that are called __________ .

5. The principal arteries that supply the head and __________ are the common __________ arteries.

6. At about the level of the __________ bone, each common carotid divides into the internal and __________ carotids.

7. The __________ artery supplies the tongue.

8. At about the level of the lower part of the __________, the patient's external carotids divide into their two main branches—the internal __________ artery and the superficial __________ artery.

9. The four branches of the internal maxillary artery collectively supply the bones of the __________ and the __________and their supporting soft ______ .

10. The inferior __________ is the first branch given off by the internal maxillary artery. As it passes downward to supply the lower teeth and the substance of the bones, it enters the mandible through the mandibular __________ . One of the inferior alveolar's branches, the __________ artery, supplies the chin.

11. The posterior superior alveolar artery, the second branch of the internal maxillary artery, enters the maxillary bones near the upper third molar and supplies the molar and __________ teeth, the maxillary ______ , and the ______ .

12. The descending palatine artery, the third branch of the internal maxillary artery, supplies the soft tissues of the __________ palate.

13. The __________ artery is the last branch of the internal maxillary artery.

14. Just prior to coming onto the face, the infraorbital artery gives off the ______ __________ superior alveolar branch that supplies the incisors and ______ __________ as well as the maxillary __________ .

84

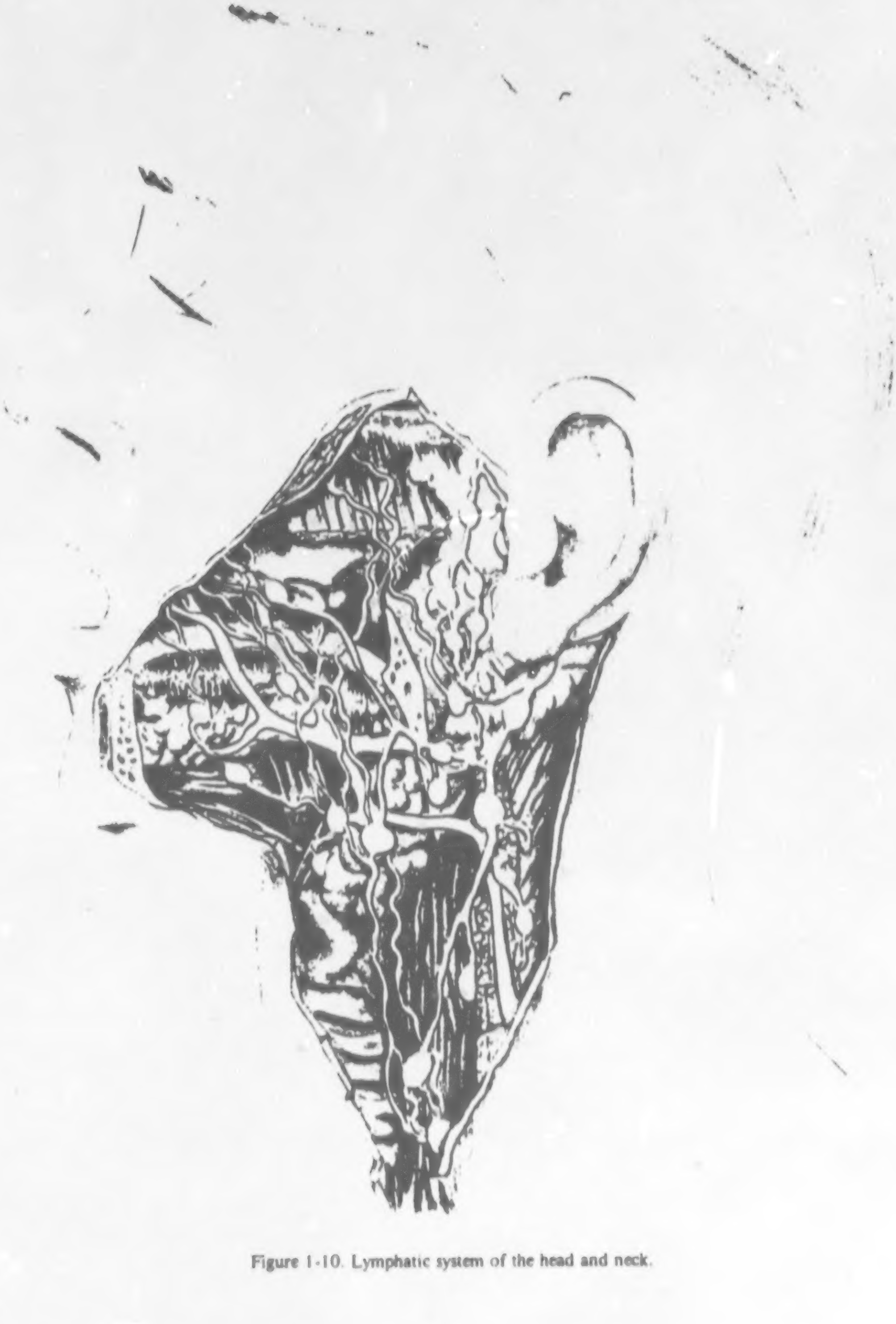


Figure 1-10. Lymphatic system of the head and neck.

93

85

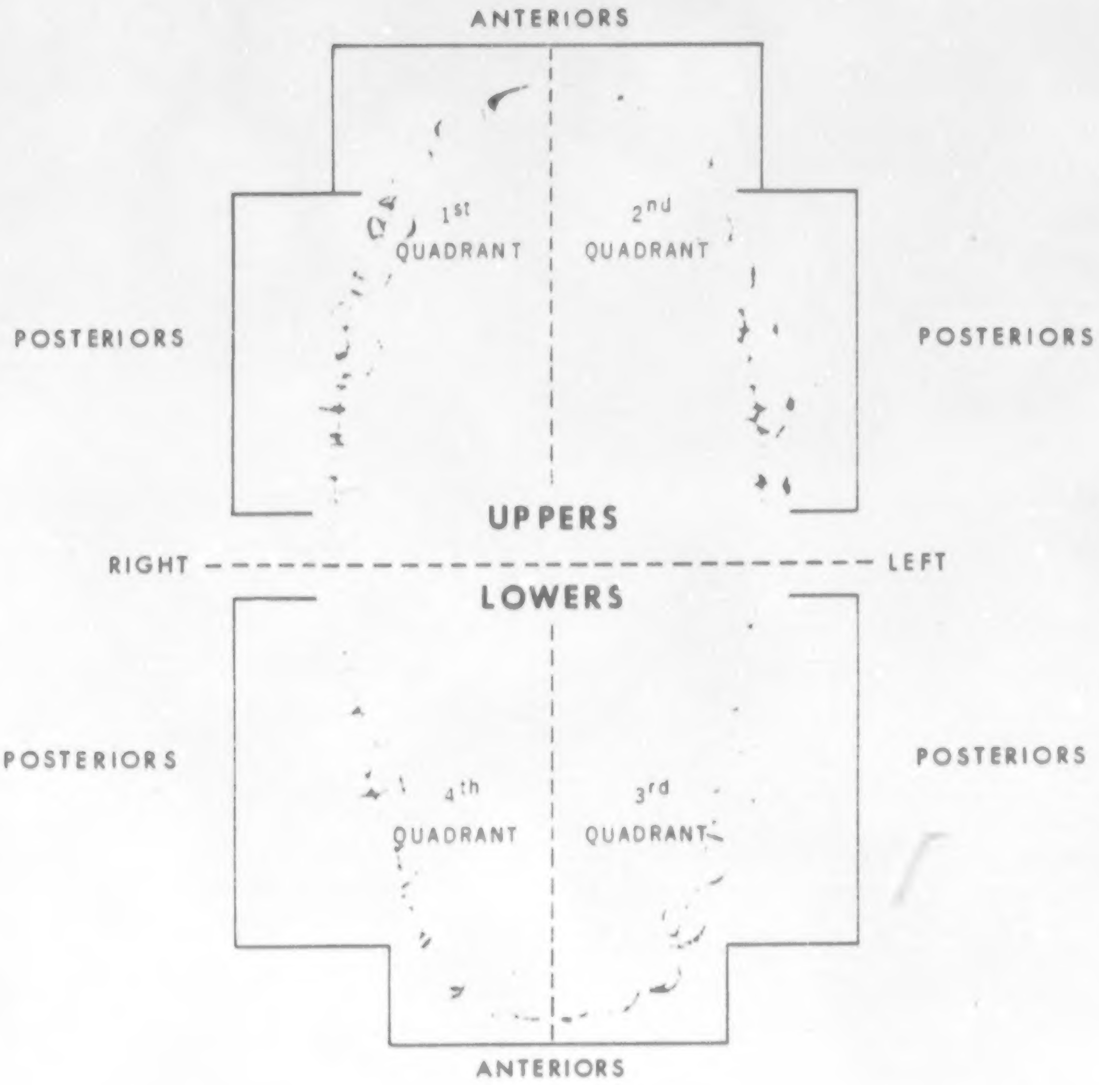


Figure 1-11. Division of teeth in the arches.

There is yet another descriptive division made in the oral cavity. This is to divide the oral cavity into an anterior and a posterior region. In dentistry, this is the most frequently used reference. Anterior means toward the front. Thus, the first three teeth on either side of the midline of each normal arch are called the anterior teeth. Posterior means toward the rear, so all the teeth behind the anterior teeth are called posterior. Refer to figure 1-11, and you can see how the arches are divided into both quadrants and anterior-posterior regions.

Surfaces of the teeth. There is really only one surface on the crown of a tooth, the coronal surface. However, because of the bending over of this surface, other areas appear, which face in several directions. These latter areas are also known as surfaces, and they receive their names from the directions in which they face.

The five surfaces of any one tooth are the same as the five surfaces of another, except for one major difference—that being the name of the working surface of the anterior and posterior teeth. The biting (working) surface of the anterior teeth is called the incisal surface, whereas the chewing (working) surface of the posterior teeth is called the occlusal surface. The four remaining surfaces of all teeth have common names, whether that tooth is anterior or posterior.

Now let us consider two common surfaces of each tooth, the distal and mesial. When you are determining the mesial and distal surfaces of a tooth, you must think of these surfaces as being on a flat plane. The relationship of the teeth in their normal arch shape and a flat plane is shown in figure 1-12. Notice that there is an imaginary line which equally divides both the upper and the lower arches between the central incisors. This line is called the midline. If we consider the place where the line divides the central incisors as our starting point, the tooth surfaces nearest this point are called the *mesial*, whereas those which face away from it are known as the *distal* surfaces. Thus, the mesial and distal surfaces of two adjoining teeth are always adjacent.

The remaining two surfaces common to all teeth are the facial and the lingual. The *facial* surface is toward the lips in the anterior region and toward the cheeks in the posterior region. The tooth surface toward the tongue in both regions is the *lingual* surface.

The mesial and distal surfaces of adjacent teeth are known as proximal surfaces, as shown in figure 1-13. The space between the proximal surfaces is called the interproximal space. The area where proximal surfaces of adjacent teeth make contact is at the greatest contour of the adjoining tooth crown. These areas are called contact areas. In this way, teeth help to support each other. As age increases, wearing occurs at these contact areas due to the movement of the teeth. The interproximal wear area widens outward from the contact area both facially and lingually. Part of the interproximal space below the wear area is filled by interdental papilla. That part not filled by this papilla is called the interproximal embrasure.

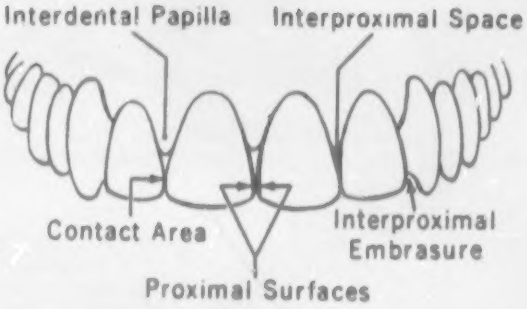


Figure 1-13. Proximal surfaces and contact areas of the teeth.

Exercises (208):

In the following exercises, identify descriptive terms related to divisions and surfaces of teeth by determining whether each statement is true or false. Circle the T or F to indicate your answer.

T F 1. The deciduous set of teeth usually consists of 32 teeth.

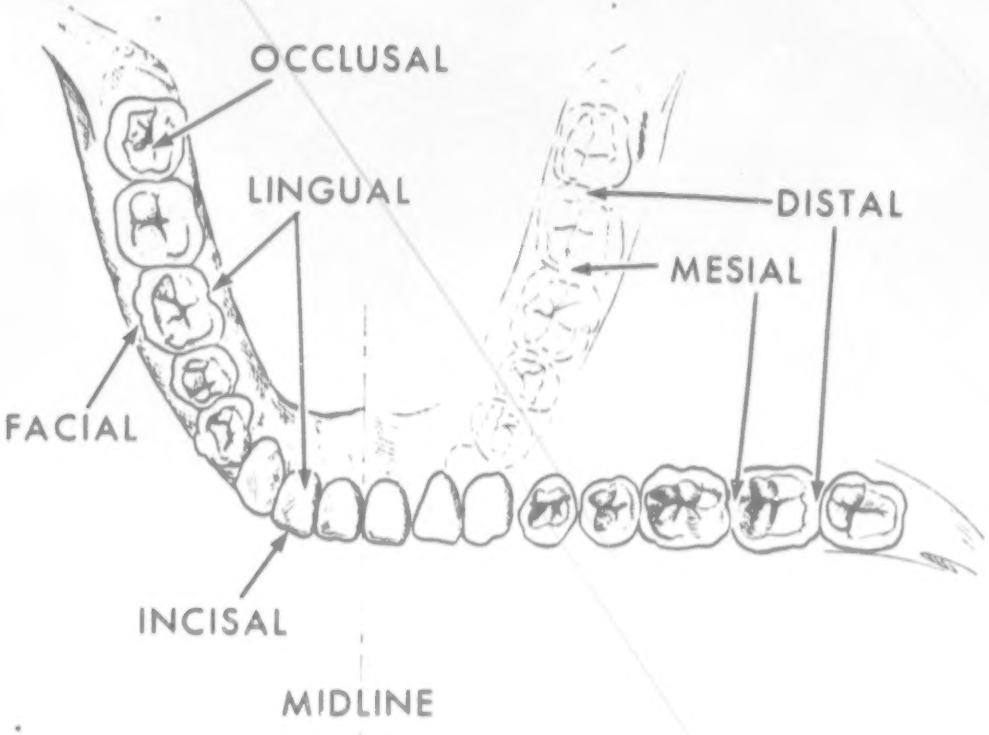


Figure 1-12. Surfaces of the teeth.

T F 2. The teeth in the lower arch are called maxillary teeth.

T F 3. Each tooth has five descriptive surfaces, and each surface is named according to the direction it faces.

T F 4. Since the arrangement of the teeth as they are embedded in the maxilla and the mandible resembles an arch, the teeth form the maxillary and the mandibular arches.

T F 6. The six front teeth of each normal arch of permanent teeth are described as anterior teeth.

T F 7. All of the teeth behind the anterior teeth are described as being in the fourth quadrant.

T F 8. The surface on the crown of any tooth can be accurately described as the coronal surface.

T F 9. All five surfaces, including the working surface of an anterior tooth, are the same as those corresponding surfaces of a posterior tooth.

T F 10. The biting surface of an anterior tooth is called its incisal surface, but the chewing surface of a posterior tooth is called its occlusal surface.

T F 11. The mesial and distal surfaces of two adjoining teeth are *never* adjacent.

T F 12. In either an anterior or a posterior tooth, the tooth's surface toward the tongue is its lingual surface.

T F 13. The mesial and distal surfaces of adjacent teeth are known as proximal surfaces.

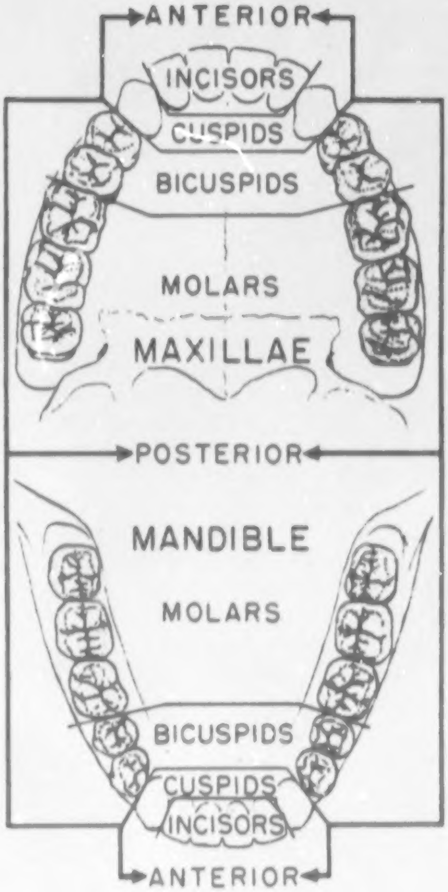


Figure 1-14. Positions of the teeth in the arches.

209. Given statements about the names of teeth, their identifying characteristics, and their associated anatomical landmarks, indicate whether each statement is true or false.

Names and Anatomical Landmarks of the Teeth. During the discussion, you should remember that all teeth are in pairs; the right and left sides are mirror images of each other. You should be as concerned with the roots of the teeth as you are with the crowns. Also keep in mind that teeth vary considerably in size, shape, and other characteristics from one person to another. To make it easier for you to understand descriptions of the teeth, the mouth has been divided into anterior and posterior regions. Within these discussions, we shall consider comparisons between the various types of teeth.

An individual tooth may be identified by its position—for example, maxillary left central incisor. It may also be identified by its anatomical form, since each tooth has its own particular characteristics that set it apart from any other tooth. The full complement of 32 permanent teeth is divided by position, shape, and function into eight incisors, four cuspids, eight bicuspids, and 12 molars. The position of the teeth in the two arches is shown in figure 1-14. Occasionally, the third molars do not erupt, because they are either impacted or were never formed. Following is a brief discussion of each type of tooth.

The anterior teeth. The front teeth are the anterior teeth. These are the teeth that are seen most while one is smiling. The anterior teeth have sharp cutting edges; there are usually six of these teeth in each arch. The incisors and cuspids constitute the anterior teeth, and all have single roots.

There are four incisors in each arch. The first of these anterior teeth to be found on either side of the midline of both the maxilla and mandible are the central incisors. Those teeth located adjacent and distally to these are the lateral incisors. The word "incisor" describes their function of incising or cutting food. Important features of these teeth are as follows:

48

- Maxillary incisors are larger than the mandibular incisors.
- Maxillary central incisors are larger than maxillary lateral incisors, whereas all mandibular incisors are approximately the same size.
- Incisors are very important, both esthetically and for correct enunciation of certain speech sounds.

The next teeth, located distally to the incisors, are the cuspids. There are two cuspids in each arch. The cuspids are so named because each possesses a sharp elevation or cusp on its cutting edge. The major difference between incisors and cuspids is that cuspids have a more sharply pointed cusp, a greater facial curvature, and a more pronounced cingulum on the lingual aspect. The cuspids are used to seize and tear food. Additional important features of these teeth are as follows:

- Each cuspid has a rounded elevation of enamel (a cusp) on its incisal surface, which gives the tooth a pointed appearance.
- The single cusp gives the cuspid its name and makes possible its function of tearing food.
- Because of their location at the corner of the dental arches, the cuspids play an important role in characterizing facial expression.
- Maxillary cuspids have the longest roots of any teeth in the mouth.

The posterior teeth. The posterior, or back teeth, are the grinding teeth. They are located behind the anterior teeth along the dental arches. Bicuspids and molars constitute the posterior teeth. All have cusps on their occlusal surfaces, with the number of cusps varying from two on bicuspids to five on certain molars. The number of roots varies from one on mandibular bicuspids to three on maxillary molars.

The bicuspids are located posterior to the cuspids and anterior to the molars. They are called bicuspids because they possess two cusps on their chewing surfaces. There are eight bicuspids in the oral cavity. Two bicuspids are found in each quadrant of the maxillary and mandibular arches. Important features of these teeth are as follows:

- Each bicuspid has two cusps on its occlusal surface, a facial and a lingual cusp.
- Cusps of the maxillary bicuspids are approximately one-half as long as the facial cusp.
- Mandibular bicuspids have single roots.
- Maxillary bicuspids may have one or two roots.
- Bicuspids are sometimes called premolars. When two roots are present, they are a facial root and a lingual root.

Molars are the largest teeth in the dental arches and lie directly behind the bicuspids. There are 12 molars in the oral cavity when they are all present, three in each quadrant. They are called the first, second, and third molars. Their function is grinding the food into a pulp during mastication. Important features of these teeth are as follows:

- Molars are the largest teeth in the mouth and normally decrease in size from anterior to posterior.
- Maxillary molars have two facial and two lingual cusps. The maxillary first molar sometimes has a small fifth cusp on the lingual aspect of its mesiolingual cusp.
- Mandibular first molars have three facial and two lingual cusps. Mandibular second molars have two facial and two lingual cusps. Mandibular third molars usually have four or five cusps.

The deciduous teeth. Deciduous teeth have certain definite characteristics that set them apart from the permanent teeth. The deciduous teeth are smaller. Their roots are proportionately longer and more slender. The pulp chamber is larger, making it more susceptible to carious exposure. The deciduous teeth have a greater constriction at the necks, giving the crowns more prominence. The enamel is whiter, and its color is more uniform. The texture of the enamel is poorer and coarser in quality. The buccal and lingual surfaces converge toward the occlusal, making the teeth appear wide mesio-distally at the gingival area. The roots diverge greatly on the molars to accommodate the crowns of the bicuspids, which are developing in the jaws. The roots of these deciduous molars surround the developing bicuspid crowns. The upper deciduous anteriors closely resemble the permanent anteriors; their general contour and the roots are about the same.

Occlusion. All of this section has led up to this one final thought—occlusion. Occlusion may be defined as the relationship of the inclines of the tooth cusps when the jaws are closed. When occlusion of a well-informed dentition is such that the cusps and depressions of the teeth interdigitate well and the greatest amount of contact between opposing arches has been established, centric occlusion is normal.

Exercises (209):

Identify whether the statements that follow regarding the teeth and their landmarks are true or false by circling the T or F.

T F 1. There are eight incisors, four cuspids, eight bicuspids, and 12 molars in a normal permanent set of teeth.

T F 2. Incisors have single roots, but cuspids have double roots.

T F 3. There are four incisors in each arch.
T F 4. Mandibular incisors are larger than are the maxillary incisors.
T F 5. As a general rule, all mandibular incisors (either central or lateral) are approximately the same size, but maxillary *central* incisors are normally larger than are corresponding maxillary *lateral* incisors.
T F 6. Since the two cuspids in each arch are used to seize and tear food, their incisal surfaces give each a pointed appearance.
T F 7. Cuspids, bicuspids, and molars constitute the posterior teeth—each of which has two roots and two cusps.
T F 8. Each bicuspid has a facial and a lingual cusp; each is sometimes called a premolar; each lower bicuspid has one root, but an upper bicuspid may have one or two roots.
T F 9. Molars are the next to largest teeth, lie directly in front of the bicuspids, and there are normally six of them in the oral cavity.
T F 10. The first, second, and third molars grind food into a pulp during mastication; they decrease in size from anterior to posterior.
T F 11. In general, most maxillary molars have two facial and two lingual cusps, but the maxillary first molar sometimes has an additional small fifth cusp.
T F 12. Mandibular molars have the same number of cusps as do their maxillary counterparts.
13. Compared to permanent teeth, deciduous teeth have the following characteristics:
  T F a. They are smaller.
  T F b. Their roots are proportionally shorter and blunter.
  T F c. Their pulp chambers are larger and more subject to exposure by decay.
  T F d. Their enamel is darker, less uniform in color, and of finer and better texture.
T F 14. Balanced occlusion occurs when the occlusal contact of the teeth on the working side of the jaw is accompanied by the harmonious contact of the teeth of the opposite (balancing) side.

1-6. Dental Histology

Histology is the microscopic study of the structural elements of an organism or of its parts. Thus, dental histology deals with the microscopic study of dental tissues. In this section, the teeth and their supporting structures are discussed.

210. Locate and identify the tissues that compose the teeth.

Tissues of the Teeth. Each tooth has a crown and a root portion. The crown is that part of the tooth that may be seen in the normal, healthy mouth, protruding from the gingiva. The root is that part of the tooth that is normally present in the gingiva and alveolar bone structures. The narrow portion of the tooth, where the crown and root meet, is called the neck or cervix. The tip of the root is its apex. If you were to section a tooth in a longitudinal plane, you would see that both the crown and the root consist of two layers of hard substance surrounding the dental pulp. The outer layer of the root is covered by a substance called cementum, and its inner layer is dentin. In the innermost portion of the tooth, there is a chamber that contains the nerves and blood vessels. This chamber is known as the pulp chamber. The anatomical structures of a tooth can be seen in foldout 4,A. When a tooth erupts into the mouth, the entire crown is covered by a membrane called the enamel cuticle or primary cuticle. Mastication of food and brushing of the teeth soon wear this cuticle away on the exposed surfaces.

Enamel. Enamel is the hardest calcified tissue in the human body. It covers the entire crown and protects the underlying structures. It is composed of 96 to 98 percent inorganic materials, principally calcium and phosphorus, and from 2 to 4 percent organic material. As seen in foldout 4,B, the structural composition of enamel consists of rods, or prisms, which are bound together by an intercementing substance. Each enamel rod extends from the junction of the enamel and dentin to the outer surface of the tooth. As the enamel is formed, brief pauses in its development cause areas of diminished calcification. These appear as narrow, brown lines when viewed under a microscope. The lines are comparable to growth rings in a tree trunk. They are called lines of Retzius, after the man who discovered them. Narrow cracks may develop in the enamel in planes of tension, either during development or after the enamel is formed. These cracks become filled with organic materials and are known as enamel lamellae. The lamellae extend from the outer surface of the enamel toward the dento-enamel junction. In some instances, they may reach the junction or even penetrate the dentin.

The enamel is formed by specialized cells called ameloblasts. After the ameloblasts have formed the enamel, they degenerate and disappear. Therefore, after the enamel has been formed, it has no further power of growth or repair.

Dentin. Dentin is the next hardest calcified tissue in the human body, and it forms the major portion of a tooth. It is composed of approximately 70 percent inorganic material and 30 percent organic material. Just as with enamel, the main constituents of the inorganic material are calcium and phosphorus.

Dentin consists of dentinal tubules held together by a calcified matrix. The structures of dentin can be seen in foldout 4,C. Study this figure as the discussion of the dentin is presented. The dentinal tubules appear as hollow tubes. They extend from the dento-enamel junction to the surface of the pulp chamber. Odontoblasts, cells which produced the dentinal tubules, are found at the pulp chamber surface (see foldout 4,E). They are active cells, since they still receive nourishment from the blood vessels in the pulp tissue. On occasion, the tubules may extend past the dento-enamel junction and terminate in the enamel. Each of these tubules contains a cytoplasmic extension of the odontoblasts. These extensions are known as Tome's fibers. It is theorized that Tome's fibers transmit pain impulses from the dentin to the pulpal nerves located adjacent to the odontoblasts, since nerve fibers have never been identified within the dentin. Mechanical stimuli, such as is produced by dental burrs, produce pain at the dento-enamel junction but not in the dentin proper, except near the pulpal chamber. Thermal and chemical stimuli may cause pain at any level within the dentin. Continuous stimuli from any of these may cause the odontoblasts to again become active and thereby recommence producing dentin.

The formation of the dentin starts in the tips of the cusp and proceeds inward toward the pulp chamber. The initially formed dentin is called primary dentin, while later deposits are called secondary dentin. The formation of secondary dentin is possible because the odontoblasts remain along the pulpal wall. The formation of secondary dentin usually occurs in response to an external irritation, such as dental caries or thermal stimuli. The layer of secondary dentin is produced in an attempt to protect the vital pulp tissues.

Cementum. Cementum is a thin layer of bonelike tissue covering the roots of the teeth. The structures of the cementum can be seen in foldout 4,D. Its composition is approximately 55 percent organic material and 45 percent inorganic material. The organic material is primarily composed of collagen. This collagen is present in all connective tissue and dissolves into gelatin when boiled. The cementum and enamel meet each other at the cervix of the tooth at what is called the cemento-enamel junction.

Cementum is produced by cells called cementoblasts. These cells begin to form cementum at the surface of the dentin of the roots. Then, as they produce the cementum, they imprison connective tissues in the cementum. These extensions are called periodontal membrane or ligaments. Normally, there are two layers of cementum present on the root. The inner layer, or the layer next to the dentin, is called the acellular layer since it contains no cells. The outer layer is a cellular layer because it contains the remains of the cementoblasts. Removal of the cellular layer by mechanical means, such as tooth scaling, will result in a loss of cementum that will not be replaced.

The principal function of cementum is to serve as an attachment for the periodontal fibers that anchor the teeth to the bony walls of their sockets. The cementum is formed throughout the life of the tooth. This continuing formation compensates for growth of the tooth into the oral cavity and movement of the tooth by external forces. The process allows the periodontal fibers to continuously reattach to the root surface so that the teeth may be moved and still remain firmly seated in the alveolar bone.

Exercises (210):

Complete the following exercise by matching the tooth tissue in column B to the appropriate statement in column A. Some tissues may be matched more than once.

Column A

____ 1. Functions to form enamel.
____ 2. Each has a crown and a root portion.
____ 3. That part of a tooth normally present in the gingiva and alveolar bone structure.
____ 4. The narrow portion of a tooth where the crown and root meet.
____ 5. The *hardest* calcified tissue where the crown and root meet.
____ 6. Functions to form dentin.
____ 7. Composed of 96 percent to 98 percent inorganic material.
____ 8. Transmits pain impulses from the dentin to the pulpal nerves.
____ 9. Usually is formed in response to an external irritation.
____ 10. When viewed microscopically, these resemble narrow brown rings of a tree trunk.
____ 11. The tip of the root.
____ 12. The *next* to the hardest calcified tissue in the human body; forms the major portion of a tooth and appears to be light yellow.
____ 13. The vital center of a tooth.

Column B

a. Neck or cervix.
b. Enamel.
c. Root.
d. Pulp chamber.
e. Crown.
f. Enamel cuticle.
g. Dentin.
h. Tooth
i. Lines of Retzius.
j. Apex.
k. Dental pulp.
l. Cementum.
m. Odontoblasts.
n. Ameloblasts.
o. Tome's fibers.
p. Secondary dentin.

91

Column A

____ 14. A membrane that covers the entire crown of a newly erupted tooth.
____ 15. A thin bonelike tissue that covers the outer layer of the root.
____ 16. Covers a tooth's entire crown and protects its underlying structure.
____ 17. The layer beneath the enamel.
____ 18. That innermost part of the tooth that provides space for nerves and blood vessels.
____ 19. That part of the tooth that protrudes from the gingiva.

211. Name and identify the tissues surrounding the teeth and state their functions.

Tissues Surrounding the Teeth. The tissues that surround and support the teeth are known as the periodontium and include the following: the periondontal ligament, the alveolar process, and the gingiva.

Periodontal ligament. The teeth are imbedded in the bony sockets of the alveolar processes, the entire function of which is to support the teeth. The periodontal ligament is composed of fibers that attach to both the cementum of the tooth and the alveolar process. Their function is to hold the teeth in place in a semirigid state. The gingivae consist of the free gingiva and the attached gingiva. The following descriptions of the individual tissues will more fully explain the relationships of the tissues to the teeth.

The periodontal fibers completely surround the root of the tooth—except for the apical foramen—and attach the root to the wall of the bony socket. The functions of the periodontal ligament are support, sensation, nutrition, and formation. The fibers support the tooth within the socket. The nerves and blood vessels provide sensation and nutrition to the cells of the ligaments. The main tissue elements of the periodontal ligament are connective tissue fibers.

As the tooth erupts, the periodontal fibers form bundles to support the tooth. The bundles are arranged in such a manner as to withstand the functional stresses of the tooth after it reaches the occlusal plane. These fibers are somewhat elastic and permit a certain amount of tooth movement. The principal fibers are so arranged that they apply a pulling force on both the cementum and the alveolar process when a force is applied to the tooth. The list below identifies the principal fiber groups comprising the periodontal membrane.

a. Gingival fiber group—Extends from the cementum to the gingiva.

b. Transeptal fiber group—Connects the cementum of adjacent teeth by running from one tooth over the alveolar crest to the adjacent teeth.

c. Alveolar fiber group—Connects tooth to alveolar bone, as shown in figure 1-15. This group is further broken into its principal fibers: (1) alveolar crest fibers extend from the cervical cementum to the crest of the alveolar bone; (2) horizontal fibers extend from the cementum to the alveolar bone at right angles to the tooth root; (3) oblique fibers extend obliquely from the cementum of the apical two-thirds of the root to the alveolar bone; (4) apical fibers extend from the cementum surrounding the apex of the root to the alveolar bone, and (5) interradicular fibers extend from one root to another in multirooted teeth.

Alveolar process. The alveolar process is that bony portion of the maxillae and mandible that supports the teeth. The alveolar process is composed of two parts: the cortical bone and the cancellous bone.

The outer portion on both the lingual and the facial surfaces of the alveolar processes is covered by cortical bone. Cortical bone is dense, compact bone. It covers the alveolar processes and is continuous with the body of the jaws. The cortical bone gives the alveolar process its shape and protects the softer bone and tissues inside.

Cancellous bone is a porous, spongy type of bone, often called spongiosa. In composition, cancellous bone is a network of narrow spaces and spicules called trabeculae. Blood and lymph vessels course through this cancellous bone to the periodontal ligament. After a tooth has been removed, this network of vessels applies the nourishment needed to heal the socket.

The alveolar process undergoes continuous change due to growth, stress, advancing age, and tooth loss. Since the principal function of the alveolar process is to support the teeth, the entire alveolar process undergoes partial atrophy, or decreases in size, when the teeth are lost.

The gingiva. The gingival tissue surrounding the teeth consists of the free gingiva and the attached gingiva. The free gingiva lies relatively close against the crown just above the cervix. The edge of the free gingiva that is towards the occlusal and incisal surfaces of the teeth is called the gingival margin. The V-shaped space reaching from the free gingival margin to the depth where the gingiva attaches to the tooth is called the gingival sulcus. The triangular fold of tissue that fills the space between adjacent teeth is the interdental papillae.

The attached gingiva is that portion covering the alveolar bone. It is mainly connective tissue, covered by epithelium, which is held snugly against

100

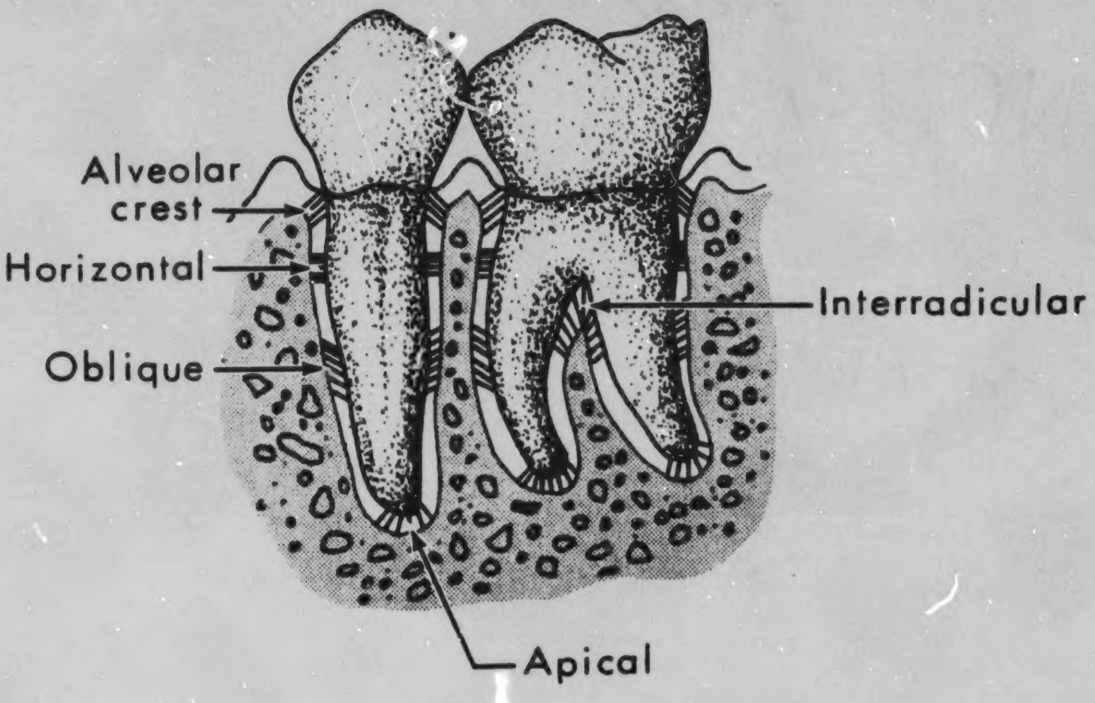


Figure 1-1[illegible]. Apical fiber group.

the alveolar cortical plate. The attached gingiva closely follows the outline of the supporting alveolar bone, rising over root eminences and developing into valleys between these eminences. The entire gingiva contains a very rich nerve and blood vessel supply, and when healthy, this tissue has a stippled appearance.

Exercises (211):

1. *a.* What is the general name for those tissues that surround and support the teeth? *b.* Name its three parts.

2. Name four functions of the periodontal ligament.

3. Why are the periodontal fibers somewhat elastic?

4. What structure undergoes continuous growth or change, supports the teeth, but undergoes partial atrophy when the teeth are lost?

5. What is the function of the dense, compact, cortical bone that covers the lingual and facial surfaces of the alveolar processes?

6. What is cancellous bone?

7. Name and locate the two parts of the gingival tissue.

9.3

CHAPTER 2

Oral Pathology

PATHOLOGY IS the study of any abnormal physical condition. This chapter provides you with fundamental knowledge of the most common pathology of oral structures. Although it is not your duty to diagnose oral conditions, basic knowledge of these conditions is essential in the performance of your duties. For example, if you recognize an abnormal condition, you can call it to the attention of the dental officer. In addition, you will use knowledge gained here when making entries on dental records and other dental forms.

2-1. Pathologies of the Teeth

The primary effort in Air Force dental clinics is directed at treating pathologies of teeth and periodontal diseases. In this section, we will review the common pathologies of the teeth. These include dental caries, pulpitis, abscesses, pericoronitis, cysts, and granulomas. Since the treatment of these pathologies is the reason for your employment, you should be thoroughly familiar with them. We begin our discussion with the etiology, signs, symptoms, and treatment of dental caries.

212. Indicate basic aspects related to the etiology, signs, symptoms, and treatment of dental caries.

Dental Caries. The most common of all dental diseases is dental caries. The possibility of decay begins with the eruption of the deciduous teeth and continues throughout life, with certain peak periods. Decay starts in the enamel and, if unchecked, progresses into the dentin. It begins when bacterial actions start a gradual dissolution of tooth substance.

Etiology. As was mentioned, the etiology, or cause, of dental caries is bacteria. Normally, these bacteria are present in the mouth of every individual. All dental caries begin when plaque deposit on the tooth surfaces becomes laden with bacteria. Dental plaque is a filmlike covering that is often difficult to see. The plaque is firmly adherent to the tooth surface and is composed of mucus, tissue cells, and different types of bacteria. If we paint the teeth with a dye, such as a disclosing solution, the plaque will become stained and will be easily visible. However, an area of the tooth surface that is really clean and not covered with plaque will not retain the dye color. Tooth decay most commonly occurs in the pits, fissures, grooves, and interproximal and gingival areas—those locations where bacterial plaques are most readily formed, since they are not easily cleaned. Both neglect and lack of oral hygiene contribute to the process of dental caries: so does a diet high in carbohydrates and refined sugars. No age group is entirely free from the disease, but caries activity is highest up to about 28 to 30 years of age. Basically, there are two theories as to the etiology of dental caries.

The first is the acidogenic theory. This theory states that dental caries is the result of the combined action of acids and bacteria. The carbohydrates and refined sugars are ingested as food by the bacteria *Lactobacillus acidophilus* and *streptococci* to produce lactic acid. Lactic acid first dissolves the inorganic material of the enamel and dentin, thereby permitting the bacteria and their products to dissolve the remaining organic material of the tooth substance.

The second is the proteolytic theory. This theory explains the process of dental caries in the following manner: Bacteria first penetrate small fissures of the enamel. The bacteria in the plaque can produce proteolytic enzymes and then are able to destroy the matrix or cementing media of the enamel and also decalcify the tooth. The mechanism of caries development can be summarized as follows: Enamel caries is primarily a process of decalcification and proteolysis (proteolytic theory). The important point to remember is that neglect causes the plaque to form. Fundamentally, in both of the above theories, the plaque supplies the bacteria needed to cause dental caries.

Signs and symptoms. A *sign* of a disease is an objective manifestation. The examiner can positively determine a sign; swelling is an example. A *symptom* of a disease is a subjective manifestation. Only the patient can positively identify a symptom; pain is an example. Sometimes the very early signs of dental caries can be detected by a thorough examination, including radiographs of the teeth. The appearance of a carious lesion depends upon the rapidity of the process as well as upon other influencing factors.

In some instances, you will find indications of small areas of decalcification of the enamel. Sometimes, even after dental caries has begun in the enamel, decalcification stops for reasons unknown; such caries are called arrested caries. However, the process of dental caries usually continues through the enamel toward the dentin. As the carious process continues, you may see a discoloration of the tooth structure, an increase in the translucency of the tooth structure, and the formation of a cavity which varies in color from light yellow to dark brown or black.

In caries of the dentin, either a leathery substance or a spongy mass is formed as the result of decalcification. Either variety can easily be removed with an excavator. However, should some change take place along the pulpal wall excited by the decay process, a hardened layer called secondary dentin is laid down within the pulpal chamber adjacent to the decay. This secondary dentin acts as a protective lining or insulator for the pulp tissue.

Quite often, dental caries presents a combination of signs and symptoms, which must be evaluated in order to arrrive at a correct diagnosis. Generally, the tooth first becomes sensitive to cold foods and liquids and then to foods and liquids containing high concentrations of sugars. Pain may also occur as a result of local irritations from food particles that have become trapped between the decayed tooth and the adjacent tooth and thereby exert pressure upon the interdental papillae. Pain, resulting from the above stimuli, is a symptom of what is normally termed simple tooth decay. If no treatment is given for this condition, the carious lesion continues to get larger; this, in turn, creates additional complicating factors.

Treatment. Since dental caries is a disease of a tissue that cannot regenerate or repair itself, the lesion is progressive. Sometimes it may be self-limiting, a condition known as arrested caries, but the destroyed area is never self-repaired. Repair can only be accomplished by dental restorations (filling).

Exercises (212):

1. What is the most common of all dental diseases?

2. What is the cause of dental caries?

3. What is the composition of dental plaque? What role does it play in tooth decay?

4. Which theory of tooth decay involves the dissolving of tooth structures by lactic acid?

5. What supplies the bacteria needed to cause tooth decay in both theories of dental caries?

6. What is the difference between a sign and a symptom?

7. What are arrested caries?

8. Describe how caries of the dentin appear.

9. What is the purpose of the secondary dentin that is the result of the cellular stimulation caused by the caries?

10. What are generally the first symptoms of tooth decay?

11. What is the only way dental caries can be repaired?

213. Indicate basic aspects related to the etiology, signs, symptoms, and treatment of pulpitis.

Pulpitis. The term "pulpitis" simply means an inflammation of the pulpal tissue. Two types of pulp inflammation are possible: primary and secondary. Primary pulpitis is the condition that results from direct injury to the pulpal tissue by formation of dental caries or by other traumatic causes. Secondary pulpitis is usually due to the patient's general health conditions.

Etiology of primary pulpitis. The most common cause of primary pulpitis is extensive tooth decay. The more severe the caries, the greater will be the damage to the pulp. This type of pulpitis may also be the result of irritation by chemical substances,

TABLE 2-1
STAGES OF PRIMARY PULPITIS

Stages	*Etiology*	*Signs and Symptoms*
1 Hepereinia	Irritants to pulp 1. Decay close but not into pulp chamber. 2. Exposed dentine—chipped. 3. Small pulp exposure. 4. High restoration or heat from dental drilling.	Tooth sensitive to: 1. *Cold*—heat feels better. 2. Touch—smarts while chewing. Pain is short and sharp. 3. Pulp tester reads very sensitive (low reading).
2. Acute pulpitis*	1. Decay into pulp chamber. 2. Beginning of infection in chambers. 3. Progresses from untreated hyperemia.	Tooth sensitive to: 1. Heat and cold. 2. Pulp tester reads like hyperemia. 3. Severe pain—whole side and head aches.
3. Chronic pulpitis	Infection progresses from untreated acute pulpitis.	1. Usually no pain. 2. May feel itchy and elongated due to formation of abscess. 3. Heat hurts—cold feels better. 4. Very high reading on tester.
4. Necrosis	Entire pulp chamber is necrotic or suppurative from progression of chronic pulpitis. Forms abscess.	1. Usually very painful with throbbing, boring pain due to pressure of suppuration. 2. Cold relieves pain a bit. 3. Swelling - toothache. 4. No reading on pulp tester.

*Secondary pulpitis is always acute, coming from a general body condition with the same symptoms as primary pulpitis.

thermal changes, or trauma sufficient to injure the cells of the pulp..

Etiology of secondary pulpitis. Secondary pulpitis is an inflammatory condition of the pulp chamber due to a systemic disease; it is a secondary effect of a more prominent disease of the body. It is exhibited by swelling of the blood vessels within the pulp chamber. Sometimes a sinus irritation causes the blood vessels that course through the maxillary sinus to become enlarged within the pulp chamber. More frequently, however, the protective sheath for the nerves that course through the infected sinus membrane becomes irritated and causes the patient to believe his pain stems from his teeth rather than his sinus. Such a sensation is known as *referred pain.*

Signs and symptoms. In the condition of acute pulpitis, we generally find that the tooth is extremely sensitive to heat but is relieved by cold applications. A person experiences a piercing and pulsating pain when lying down and, thus, the pain is more severe while he is in bed at night. Also, the pain may be increased by pressure or percussion. Pain experienced with acute pulpitis is more severe than that of simple dental caries of chronic pulpitis because of the inflammation of the pulp tissue within the pulp chamber and apical bone. Chronic pulpitis is the result of bacterial acids causing minor inflammation of the pulp chamber. Also, in chronic pulpitis, there is only dull, obscure pain—usually no pain with percussion and very little pain with heat—and the pulp is still vital. Normally, this stage of pulpitis precedes acute pulpitis. In some cases, however, even before any bacteria enter the pulp, their products may reach it and induce such changes in the pulp tissue as edema, hyperemia, and other inflammatory processes. Since the pulp is contained in hard, unyielding walls, the swelling produced by processes like edema (accumulation of serous fluid) and hyperemia (excessive accumulation of blood) causes pressure that may soon result in death of the pulp. Refer to table 2-1 to see the stages of primary pulpitis, etiology, and the signs and symptoms of each stage.

Treatment. Treatment of pulpitis in its early stages is usually performed in the restorative section of a dental clinic. This treatment may consist of removing the irritant and inserting a sedative filling. In the later stages of pulpitis, treatment is normally performed in the endodontic section. The treatment at this stage may be what is called a pulpotomy (removal of the coronal portion of the pulp). Should pulpitis lead to necrosis of a tooth, the tooth is said to be nonvital. A nonvital tooth is treated in either the endodontic section or the oral surgery section. Treatment in the endodontic section essentially entails the removing of the necrotic pulp and replacing it with a suitable root canal restorative material. In oral surgery, a nonvital tooth that cannot be treated is usually extracted.

Exercises (213):

1. What is pulpitis?

2. What is the most common cause of primary pulpitis?

3. What is secondary pulpitis? What is its cause?

4. What agents or factors increase the pain experienced by a patient with acute pulpitis?

5. What type of pain is usually experienced with chronic pulpitis?

6. What may happen to the pulp as a result of the pressure produced by swelling caused by edema and hyperemia?

7. How is pulpitis treated during its early stages?

8. What treatment would be performed on a tooth that has become nonvital as a result of pulpitis?

214. Indicate basic aspects related to the types of dental abscesses, their etiology, signs, symptoms, and treatment.

Abscesses. By definition, an abscess is a localized collection of pus in a cavity formed by the disintegration of tissue. To understand this more clearly, let's break this definition down to its simplest meaning. To localize something, we limit or confine it to a particular place, area, or locality. Pus is an inflammation product, consisting of cells, leukocytes, liquor puris (the liquid portion of pus), and organisms that identify the type of abscess. Disintegration is the decay or separation into fragments. Thus, an abscess is a collection of cells, liquor puris, and organisms in an area limited to one region with one or more spots formed by the decomposition or decay of tissue.

Periapical abscess. The most common condition following untreated acute pulpitis is a periapical abscess. A periapical abscess is the localized collection of pus at the apex of a tooth and may be classified as either acute or chronic.

An acute periapical abscess is a rapidly progressive inflammatory process, in that the surrounding tissues become swollen and red. Usually, distressful quantities of pus form within 24 hours. The area becomes extremely painful, and the abscess rapidly increases in size, with the pus searching for an outlet. The tooth may be extruded slightly from its socket. The periodontal membrane breakdown, due to the abscess, may cause the tooth to become loose. The tooth is very sensitive to percussion, and the body temperature is elevated. When heat is applied to the offending tooth, the pain is increased; however, when cold is applied, the pain is decreased. When the red, swollen tissue covering the gingiva at the apex of the tooth is depressed, a blanching effect can be seen. If a pulp tester is used, no reading will be recorded, indicating the necrotic (dead) condition of the pulp.

The chronic periapical abscess is a condition that is of much longer duration than the acute type but is less painful and has little tendency to spread. As a rule, the pain occurs only when pressure is placed on the tooth in a certain direction. When a pulp tester is used to check this condition, normally no reading is obtained. In most instances, the abscess is walled off; however, the membrane is usually attached more firmly to the bone than to the root of the tooth. There is very little redness or swelling involved.

If an abscess remains untreated, it will continue to progress in the direction offering the least resistance. The accumulated pus eventually penetrates the cortical plate to emerge into the gingival tissue and forms a parulis (gum boil)—see figure 2-1. Eventually, a fistula will form and allow the pus to drain. In most cases, there is a swelling of the face in the area of the abscess. If the infection does not localize, then a hard, boardlike swelling called cellulitis spreads through the tissues of wide areas of the face and neck. Usually, a constant, pulsating pain is experienced while the abscess is forming. However, when drainage is established, the pain is almost instantly relieved. Treatment may involve root canal therapy or the removal of the infected tooth.

Parietal (periodontal) abscess. This is an abscess that more often develops alongside the tooth. It locates between the gingiva and the tooth, and it involves the periodontal membrane and the

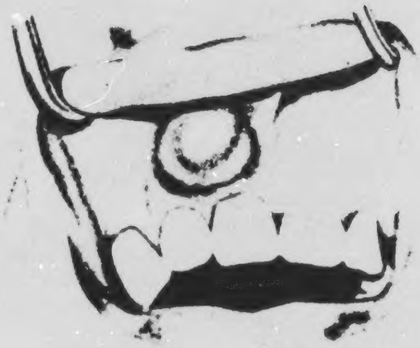


Figure 2-1. Periapical abscess.

supporting alveolar bone. The parietal abscess may undergo both acute and chronic changes in its progress toward resolution, and it has to be treated according to the stage of tissue inflammation.

Usually, the etiology of a parietal abscess stems from a foreign body irritant that becomes embedded in the space between the tooth and the soft tissue, or completely within the soft tissue adjacent to the tooth. The most common causes of parietal abscesses are calculus formation, overhanging fillings, fractured fillings, impacted food particles, popcorn husks, and toothpicks, which become wedged in the interproximal areas. Another cause may be a deep gingival or periodontal inflammation that becomes walled off. This prevents drainage and results in acute swelling.

In the acute stage of a parietal abscess, a typical inflammatory reaction occurs within the tissue. Ordinarily, the gingiva around the abscess is very swollen. Too, there may be swelling of the face and, occasionally, enlargement of the regional lymph nodes coupled with a slight elevation of body temperature. Pain associated with the lesion may vary from mild to quite severe. The tooth is rarely sensitive to percussion; however, pressure on the inflamed gingiva is quite painful. Application of heat or cold to the inflamed area causes no particular increase in the pain. The mucous membrane appears red, swollen, and inflamed, and is quite tender. The degree of swelling depends upon the extensiveness of the infection. When the irritant is removed and drainage is established, the pain or discomfort will disappear.

Cellulitis. Cellulitis is an inflammation of the soft tissue structures. It may occur as a complication from a dento-alveolar abscess or as a postoperative complication following extensive surgical procedures in the mouth. In either event, the signs and symptoms are quite similar. The onset of a cellulitis of the oral structures is manifested by edema of the soft structures, quite often extensive (see fig. 2-2). Pain is usually severe and throbbing, and it increases with pressure. As the inflammation develops, the central area may assume a red, shiny appearance. A high fever is associated with cellulitis (104° F. to 105° F.), along with a rapid pulse and headaches. Trismus (spasm) of the involved masticatory muscles also occurs. In some cases, rather than the typical abscess production, a chronic cellulitis follows the acute phase, with persistent deep swelling. In other instances, severe extensive inflammation is apparent from the onset.

Exercises (214):

1. Define an abscess.

2. Name the types of periapical abscesses and state their location.

3. Differentiate briefly between an acute and a chronic periapical abscess as to pain, redness, and swelling.

4. State two recognized treatments for a periapical abscess.

5. Summarize the usual etiology (causes) of a parietal abscess.

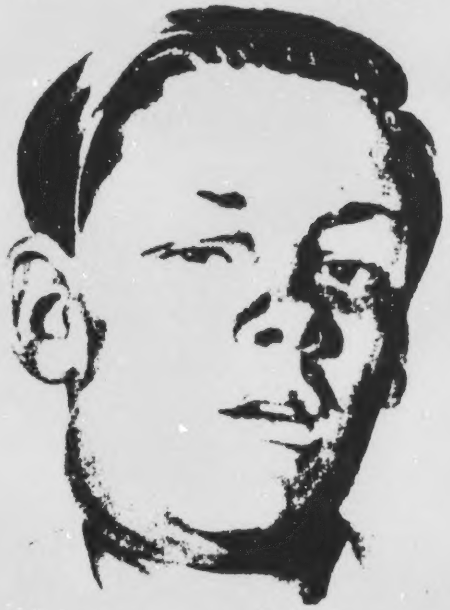


Figure 2-2. Cellulitis of the jaw.

6. State the usual effect, in regard to pain, of the application of heat or cold to a parietal abscess.

7. State, in summarized form, the signs and symptoms of cellulitis.

215. Indicate basic factors related to the etiology, signs, symptoms, and treatment of pericoronitis.

Pericoronitis. This is an inflammation around the crown of the tooth. Most frequently, it occurs around the crowns of partially erupted teeth, especially the third molars or wisdom teeth. Pericoronitis of the third molar can be seen in figure 2-3. However, any partially erupted tooth may be affected. In this condition, a flap of gingival (gum) tissue called an operculum extends over the unerupted portion of the tooth; and, just as in a parietal abscess, it establishes an ideal pocket for the accumulation of food debris. The environment is warm, dark, and moist; consequently, such an area is ideal for the growth of bacteria. As the bacteria multiply under these conditions, an infectious process is initiated. It causes pain, pus formation, swelling, and, at times, trismus of the muscles of mastication in that particular area. With trismus, the patient has difficulty in opening his mouth. Sometimes, he is unable to open it more than one-half inch. Although this condition is frequently brought about as the result of a partially erupted tooth, it may be aggravated by mechanical trauma and, as we have mentioned, by secondary bacterial infection.

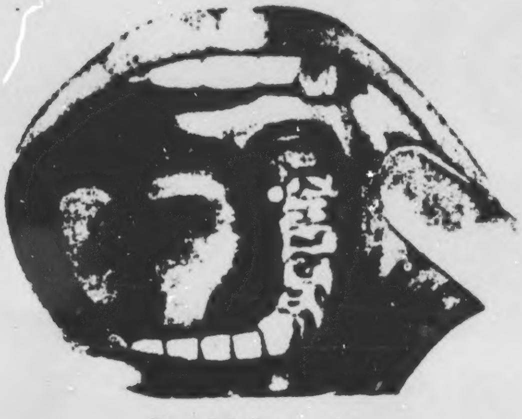


Figure 2-3. Pericoronitis.

There are many signs and symptoms associated with pericoronitis. The gingiva around the tooth is inflamed. Swelling occurs in the infected gingival tissue, and it may extend into the adjacent tissue. There may be an accumulation of pus, along with severe throbbing pain and trismus of the muscles in the affected area. Fever and generalized cellulitis may develop in chronic cases. In most cases, pericoronitis lasts about a week if it does not become extensive and if the infection is not of an extremely virulent type. In some cases, it may then slowly disappear only to recur again in 3 or 4 weeks unless the dental officer gives definitive treatment.

Treatment of pericoronitis varies according to the condition. If the tooth involved is erupting into a normal and functional position, the dentist will probably elect a treatment procedure designed to save the tooth. Such a procedure could involve flushing out the pocket area and instructing the patient how to keep the area clean. In some cases, the dentist may have to remove the operculum by surgical excision. In cases where the tooth cannot erupt into a normal and functional position, it is usually removed.

Exercises (215):

1. An inflammation occurring around the crown of a partially erupted third molar would be called ______________ .

2. The pain, pus formation, and swelling associated with pericoronitis often result from the growth of ______________ in food debris that has accumulated in an area where growth conditions are ideal.

3. If a patient with pericoronitis of a partially erupted tooth has difficulty in opening his mouth, the difficulty results from ______________ of the affected muscles of mastication.

4. The involved tooth is erupting into a normal and functional position, but, so far, flushing and oral sanitation have not proven effective in the treatment of pericoronitis. In this case, the dentist should continue treatment by removing the ______________ by surgical excision.

5. In cases of pericoronitis where conditions are such that the tooth cannot erupt into a normal and functional position, the best treatment is to ______________ the tooth.

216. Identify key facts concerning the etiology, signs, symptoms, and treatment of the most common types of cysts encountered in the treatment of dental patients.

Cysts. While there are many types of cysts, the two most common types you will encounter in the treatment of dental patients are inflammatory and developmental cysts. Treatment normally consists of the surgical excision of the cyst, combined with a thorough curettage of the area to eliminate rest cells that could lead to its reoccurrence.

Inflammatory cysts. An inflammatory cyst is caused by some irritant that can usually be identified. Epithelial rest cells may have been left behind after the tooth was formed. A chronic periapical abscess may cause the cells to proliferate (to reproduce in quick succession) and surround the abscess. If this epithelial sac successfully surrounds the chronic abscess, it will prevent further bacterial growth by cutting off the source of nutrient. The pus will gradually turn to a clear liquid. This sac or cyst may continue to enlarge by increasing the fluid inside the sac due to an exchange of fluids through the cyst wall. Cysts can form around retained roots or any foreign chronic irritant that may be buried in the tissue. A cyst is usually asymptomatic to pain or sensitivity. This condition is usually caused by a pathology of the teeth.

Developmental cysts. Developmental cysts are usually composed of cells that were left behind after performing a particular function. One good example of a developmental cyst is the follicular cyst. This fluid-filled sac is caused by the tissue that formed the developmental sac during tooth formation. Usually this sac disappears after its job is finished. However, in some cases, parts of it remain embedded in bone or attached to the tooth. Years later, the epithelial cells of the follicle begin to multiply and cause the follicular cyst. Additionally, remnants of this sac may be left behind during third molar extraction. Since the third molar erupts comparatively late in life, it may still have some of the follicle attached. Although healing appears normal at the time, the cyst can appear some years later.

Exercises (216):

Indicate the etiology of the signs, symptoms, and treatment of the most common types of cysts encountered in the treatment of dental patients by placing the appropriate words in the blank spaces.

1. An inflammatory cyst is usually caused by a ______________ of the teeth.

2. A cyst is usually ______________ to pain or sensitivity.

3. Cysts can form around ______________ or any ______________ that may be buried in the tissue.

4. When the epithelial sac of a cyst completely surrounds a periapical abscess, the pus will turn into a ______________ .

5. A developmental cyst is caused by the tissue that formed the ______________ during tooth ______________ .

6. Treatment of cysts normally consists of the ______________ of the cyst, combined with a thorough ______________ of the area to eliminate ______________ that could lead to its reoccurrence.

217. Describe a granuloma, and state its etiology, signs, and symptoms.

Dental Granuloma. A dental granuloma is a mass of granulation tissue, usually surrounded by a fibrous sac. It is a sequel to chronic inflammation of the periapical tissues. This chronic inflammation may be the result of necrosis of the pulp cells or may be caused by nonpyogenic bacteria. The granuloma is located at the apex of the root, and the membrane that surrounds the granuloma often remains attached to the tooth as it is extracted. The tooth may be sensitive to percussion and feel slightly elongated; also, there may be a dull gnawing pain. However, in other instances, this condition may be present and offer no symptoms.

Exercises (217):

1. Describe a granuloma.

2. To what condition is a granuloma sequel?

3. Where are granulomas usually located?

4. What symptoms may be noticed by a patient having a granuloma?

2-2. Periodontal Diseases

Periodontal diseases cause the loss of more teeth than any other factor. Although the diseases more commonly affect people over 35 years of age, they are a serious threat to the dental health of patients of all ages. You can compare advanced periodontal diseases to a strong house with a weak foundation. A patient may have teeth that are free from decay—but they may be supported by weak, diseased, degenerated tissue. This section discusses gingivitis, periodontitis, and periodontosis.

218. Define gingivitis and differentiate between the types of gingivitis.

Gingivitis. The term "gingivitis" refers to an inflammation of the gingiva. This is the most common periodontal ailment that you treat in the dental clinic. You should know the types, causes, and treatment of gingivitis. Also, you must be able to explain the disease to your patients in terms that they can understand—they may not even know what the term "gingiva" means. Also, your patients need simple instructions that they can follow on how to improve their oral conditions.

Simple gingivitis. The inflammation of the gingiva may be caused by local irritants. Simple gingivitis usually is caused by inadequate oral hygiene; however, it may be caused by an overhanging filling or other local irritant. Usually, the gingiva around only a few teeth is involved. The gingiva becomes swollen and red in varying degrees around the margins. The most common type can develop in 3 or 4 days if the teeth are not cleaned.

Simple gingivitis is easily treatable by both the dentist and the patient. The treatment is to remove the local irritant. When the teeth are cleaned, the inflammation disappears. A person can have simple gingivitis one day, not have it 2 days later, and have it again a week later. It is almost a "turn-it-off-and-on" type of disease. It is especially common in children, who get careless with their oral health care if not closely supervised.

Infective gingivitis. This is caused by an invasion of micro-organisms, such as streptococci. It differs from simple gingivitis in the intensity of the inflammation. There may be no local irritant. The gingiva and the adjacent mucosa are very red and swollen. The gingiva actually looks painful—which it is. Few patients come in with pain from gingivitis, but if they do and if the redness and swelling extend onto the mucosa, the condition can be diagnosed as infective gingivitis. This type of gingivitis is treated with antibiotics. It is the only type treated in this manner.

Hyperplastic gingivitis. This type starts out as simple gingivitis (usually chronic), but you seldom see it in its simple form. You usually see the patient after the tissues have overgrown. There is an enlargement of the gingiva that is not due to swelling but to tissue growth. Actually, there is a fibrous replacement of tissue: this growth can become grossly enlarged. The papilla may grow like stubby fingers, and the condition may not recede after treatment. The gingiva is neither red nor painful. The cause is probably some low grade irritant of long standing. It may be caused by the patient's partial dentures, an overhanging filling, or a child's orthodontic clasps; or, perhaps, some drug like dilatin has been taken. Some mouth breathers have hyperplastic gingivitis—the breathing being the low grade irritant. This condition sometimes runs in families. The dental officer's treatment may be surgical excision.

Hormonal gingivitis. A hormone imbalance is responsible for this type of gingivitis. The disease occurs during the phases of life when there is a change in the hormones. With this condition, the gingiva will be enlarged, puffy, red to bluish red with short, fat, purplish papilla. It will bleed easily. This type of gingivitis appears between the teeth first, then it spreads from the interdental papilla to the marginal gingiva. The condition may involve a few or many teeth; it usually is not generalized throughout the mouth. Good oral hygiene helps alleviate this condition because this type of gingivitis, like the other types, is precipitated by a local irritant.

Necrotizing gingivitis. This disease has been called many names—from oral fusospirochetosis to necrotizing ulcerative gingivitis (NUG). It may be referred to as Vincent's infection, and during World War I our doughboys who contracted this mouth disease had "trenchmouth." The Air Force uses the shortened term NUG. But whatever it is called scientifically, vernacularly it is "bad news." In this type of gingivitis, the tissue is either dead or dying. The gingiva is swollen, red, and bleeding; the dead or dying interdental papilla is covered with a grey-white pseudomembrane (false membrane). If you squirt water on the membrane, it peels off and leaves a raw bleeding surface. There is always a fetid odor present. This odor has been described as a "very stale, tomato-juice-can smell." With the acute stage, the patient has fever, his gums are painful, and he may be unable to eat because of them. His cervical lymph glands in the neck are swollen—you may feel pea-sized lumps below the mandible that are tender to the touch. He suffers from malaise. The symptoms and signs may vary in intensity, but all are there.

Necrotizing gingivitis is caused by the vibrio (comma-shaped bacillus), bacillus (rod-shaped bacillus), and spirochete (spiral-shaped bacillus)—anaerobic bacteria that get deep down into the tissues. From the patient's physical standpoint, the causes of NUG are usually poor oral hygiene, rundown physical condition, fatigue, and emotional and physiological stress. There are several definite steps in the treatment of NUG. Treatment should be performed by the dental officer or preventive dentistry technician.

Generally, treatment consists of local debridement (cleanup).

Desquamative gingivitis. This type is linked with the hormonal type; however, it does have different characteristics. The epithelium lifts off numerous areas of the gingiva. Something attacks the epithelium, and it lifts off leaving large, raw patches. Sometimes there are blisters, especially with a patient experiencing menopause. The blisters may rupture, leaving a raw surface and a painful condition. It may require a topical anesthetic before the patient can eat. The treatment is symptomatic—keep the patient comfortable, and stress the need for improved oral hygiene.

Exercises (218):

1. Define the condition of the gums referred to as gingivitis.

In exercises 2 through 7 that follow, match the type of gingivitis listed in column A with the letter of the appropriate statement listed in column B. Write the letter of the selected statement in the blanks provided. Use every letter once, and only once.

Column A

____ 2. Desquamative gingivitis.
____ 3. Hyperplastic gingivitis.
____ 4. Necrotizing gingivitis.
____ 5. Infective gingivitis.
____ 6. Simple gingivitis.
____ 7. Hormonal gingivitis.

Column B

a. Although linked with the hormonal type of gingivitis, it has different characteristics; the epithelium may lift off, leaving large, raw patches; or sometimes there are blisters, which may rupture.

b. The only type treated with antibiotics; caused by an invasion of micro-organisms; gingiva is very red and swollen, and looks—and is—painful.

c. Characterized by enlargement of the gingiva due to fibrous replacement of tissue and not to swelling. Gingiva is neither red nor painful. Surgical excision may be a required treatment.

d. Usually caused by inadequate oral hygiene, but may also be caused by an overhanging filling or other local irritant. Gingiva becomes swollen and red in varying degrees around the margin of the few teeth involved.

e. The gingiva will bleed easily and be enlarged, puffy, and red to bluish red. The papilla will be short, fat, and purplish

Column B

f. Caused by anaerobic bacteria penetrating deeply into patient's tissues because patient's physical condition is rundown, fatigued, or because he is under emotional or physiological stress. Characterized by swollen, red, and bleeding gingiva, covered with a grey-white false membrane; fetid odor; fever; painful gums; swollen cervical lymph glands; and malaise.

219. Define periodontitis and periodontosis, describe their clinical appearance, and state the treatment for each.

Periodontitis (Pedoni). This is inflammation of the periodontia, including both the gingiva and the supporting bone. The definition sounds much like the definition for gingivitis. Once the inflammation passes the periodontal ligament fibers and the supporting structures of the tooth break down, the condition is no longer gingivitis but is periodontitis. If gingivitis is properly treated, it should not progress to periodontitis.

Periodontitis is caused by irritants in general. These irritants may be materia alba, plaque, calculus, food impaction, malocclusion, or faulty restorations. The condition may also be caused by systemic factors, such as low resistance, stress, diabetes, blood problems, or hormone imbalance. If a patient has uncontrolled diabetes, dramatic healing should not be expected.

The patient's breath will usually be foul. Irritants may or may not be present. There may be exudate in the depth of the pocket. The dental officer will most likely use X-rays and a periodontal probe when making a diagnosis. If he finds that the interproximal bone shows slight blunting, the disease is in the beginning stages. In advanced cases, there is a horizontal loss of bone and a cupping-out of interdental bone.

The treatment consists of educating the patient toward better oral hygiene and removing the local irritant when it can be found. Then the pocket should be removed, and possibly the dental officer will recontour the gingiva and bone. If there are systemic factors, the patient will be sent to a physician. Actually, you may think of the treatment for periodontitis as having four possible procedures:

(1) Education of the patient.
(2) A conservative treatment—scaling and curettage.

(3) Gingival surgery and possibly osteosurgery.
(4) Postsurgical treatment which may include occlusal equilibration.

Periodontosis (Pedono). This is an abnormal condition in which the peridontia shows degeneration. There is *initially* no inflammatory reaction. The disease is specifically defined as "an uncommon occurrence of a nonspecific noninflammatory degeneration of the periodontia."

No one is sure as to the cause of the disease. It may be a systemic factor, such as diabetes; it may be the result of early childhood malnutrition or infectious disease; it could be a defect in collagen metabolism; or a genetic factor may be involved. Dramatic bone loss is first noticed in the region of the first molars and incisor teeth. The rest of the teeth may be in good condition. This disease initially occurs most often in the 15- to 25-year age group. It has a high incidence in the middle, near, and far eastern parts of the world.

The clinical appearance of periodontosis in the early stage is widening of periodontal spaces and migration of teeth. The first signs of inflammatory involvement, local irritation and bone loss leading to periodontitis, are seen in the second stage. The third stage is characterized by progressive gingival inflammation, trauma from occlusion, deeper periodontal pockets, and increased bone loss. Another clinical appearance of periodontosis is the loosening and drifting of teeth. As these occlusal stresses become more traumatic, the patient has more bone loss. Neither pocket formation nor bone loss is part of the beginning process of periodontosis but is seen in the later stages.

The patient should be educated toward good oral hygiene; then his mouth should be thoroughly cleaned. The dental officer then treats the patient according to his needs. This treatment may include equilibrating, splinting, or extracting those teeth beyond hope of saving. Prognosis for teeth involved in periodontosis is very poor.

Although caries cause some extractions, periodontal disease accounts for approximately 90 percent of tooth loss. Good oral hygiene helps the patient keep his teeth. Remember that periodontal disease is usually the end result of poor oral hygiene!

Exercises (219):

1. Define periodontitis.

2. Describe the clinical appearance of periodontitis.

3. Describe the treatment for periodontitis.

4. Under what condition does the inflammation of the gingiva progress from gingivitis to periodontitis?

5. Define periodontosis.

6. Describe the clinical appearance of periodontosis.

7. Describe the treatment for periodontosis.

2-3. Systemic and Locally Originating Diseases

Many pathological conditions, other than those already discussed, may be seen in dental treatment. Generally, the diseases will be grouped according to the conditions that cause them. Disorders associated directly with the teeth and supporting structures are omitted, since they were discussed earlier. Diseases of the oral mucosa may be divided primarily into those related to systemic diseases and those of local origin. Diseases of systemic origin usually affect the entire body and produce some clinical pictures in the oral cavity. The infectious diseases of syphilis and tuberculosis are examples of this type of oral lesion. Locally originating diseases are due to conditions that are present only in the mouth. They include physical irritants, such as dentures, restorations, habits, and chemicals, that may be taken orally. These factors may be introduced into the oral cavity by the dentist, the technician, or the patient himself. Certain other common local infections will also be included.

220. Identify the etiology, signs, symptoms, and treatment of herpes simplex and aphthous stomatitis.

Infectious Conditions of Systemic Origin. The specific diseases discussed here are oral lesions from infections caused by a particular bacteria or virus.

Herpes simplex. Herpes simplex is a common infection usually occurring on or about the lips—often referred to as a cold sore or fever blister. The cause of this lesion is not definite. It sometimes appears as a corollary of a common cold, upper respiratory tract infection, allergy, gastrointestinal disturbance, overexposure to sunlight, fatigue, or emotional tension. Whether these factors actually cause the disease, or just contribute to it, is not definitely known. At times, it appears without obvious cause. The herpes simplex virus has been identified as the primary causative organism.

The patient may feel an itching or burning sensation prior to the eruption of one to several water blisters (vesicles). These vesicles break and crust over. The area is usually surrounded by redness and is slightly swollen. Normally, the lesions are painless but will become sore if the vesicles break and leave a raw surface. Herpes simplex is usually self-limiting and heals in 10 to 14 days without scarring.

Keep irritating drugs and spicy foods away from the lesions by coating the lips with vaseline or some other preparation. This is palliative treatment.

Aphthous stomatitis. This is a bothersome ulcer, sometimes called a canker sore, found in the mouth on the mucous membrane. The exact cause of this lesion is unknown, but a certain type of streptococcus may be a causative factor. It appears to be associated with gastrointestinal disturbances in individuals whose resistance is low and in persons who are suffering from physical or emotional stress. The term "stomatitis" refers to any inflammation of the mucous membrane of the mouth, while "aphthous" refers to vesicles which tend to form and then break down and produce ulcers.

These ulcers appear as depressions on the mucous membrane and are covered by a grayish-white or light yellowish membrane. Each such lesion is preceded by a vesicle, which normally persists for only a few hours before rupturing and producing the ulcer. The ulcers vary in size from that of a small pinhead to one-half inch at their greatest dimension. Aphthae may occur in various parts of the mouth but are most common on the lip, cheek, floor of the mouth, and tongue.

Once again, palliative treatment will keep the patient comfortable until the ulcers subside. Soothing rinses and application of surface anesthetics may be of some value. The patient is instructed to stay away from spicy or irritating foods. A dental officer should always be notified when lesions of any type are noticed in the mouth.

Exercises (220):

Indicate whether each of the following statements is true or false by circling the appropriate T (true) or F (false).

T F 1. The exact causes of herpes simplex and of aphthous stomatitis are very definite and can usually be identified.

T F 2. Herpes simplex, sometimes called a canker sore, is found in the mouth on the mucous membrane.

T F 3. Herpes simplex is usually self-limiting and heals in 10 to 14 days without scarring.

T F 4. Gastrointestinal disturbances and emotional tensions (or stresses) often precede or are associated with either herpes simplex or aphthous stomatitis.

T F 5. The lesions of aphthous stomatitis are preceded by vesicles which rupture to produce cold sores.

T F 6. When aphthous stomatitis lesions rupture, they almost always result in the formation of herpes simplex.

T F 7. Palliative treatment will keep either the herpes simplex or the aphthous stomatitis patient comfortable, since both the infection and the sore normally are self-healing.

221. Identify factors associated with the transmission and oral manifestations of syphilis.

Syphilis. This highly contagious disease can be a threat to the technicians who touch infected patients with their bare hands. It is a venereal disease which may manifest itself in the mouth. Though it is not common, transmission can occur to the hands from lesions in the mouth. Syphilis is caused by a specific bacteria, the *Treponema pallidum* spirochete. It can enter the body through any break in the skin, such as hangnails, blisters, cuts, and abrasions. Syphilis is characterized by three stages.

The first stage of syphilis is characterized by appearance of the lesion called the chancre. The chancre may appear anywhere on the body, but the most common sites are on the genitals, on the lips, or in the mouth. Clinically, in the oral cavity it is characterized by an ulcer formation with a hard border. Because it is usually painless, the patient is often unaware of its existence. The chancre is normally a single lesion, although rare cases of two or more have been reported. Any single, painless, untreated lesion appearing on the lips or in the mouth should be called to the dental officer's attention at once and should be viewed with suspicion until steps are taken to secure confirmation by laboratory procedures. The chancre is highly infectious, and although it is most commonly found on the genitals, its appearance in the mouth is not rare. The dentist and the dental technician should never overlook the possibility of its presence. The chancre goes away in about 10 days, leaving no scar.

A dangerous secondary lesion appears from 2 months to 1 year after the primary chancre disappears. It is the result of a generalized involvement of the blood and the lymphatic circulation. The causative organism enters the bloodstream at the site of the primary lesion, multiplies, and is carried throughout the body by the circulatory system. The secondary lesions may appear anywhere on the body and in large numbers. The lesions that appear on the mucous membrane are known as mucous patches. These are probably the most contagious of all the syphilitic lesions and are seldom absent from the oral mucosa during the secondary stage of syphilis. The true mucous patch is usually oval in shape with a moist, glistening, grayish-white, slightly raised surface. Other secondary lesions, however, may have radically different appearances; it is this fact which makes the clinical diagnosis of secondary syphilis difficult. As in the case of the single primary lesion, the dentist and his technician should view any painless lesions of the mucous membranes of the mouth and throat with suspicion. The dental officer will take the necessary steps for proper laboratory diagnosis.

The third and terminal stage of syphilis produces a lesion called a gumma. It may appear at any time from several months to several years after the initial infection. Usually, there are not very many lesions—often just one. The lesions in this stage are not considered very contagious, since they rarely contain the causative organisms. They appear in the mouth but not with the same frequency as do the secondary lesions. The gummas normally appear as nodules and slowly increase in size, becoming softer and less dense. Eventually, the center of the nodule becomes eroded and a definite ulcer results. The soft tissue and underlying bone are destroyed. Perforations of the palate often result.

The treatment of syphilis, regardless of stage, is a medical problem. The patient's dental requirements will be met through close cooperation with the physician treating the systemic infection.

Exercises (221):

Indicate whether each of the following statements is true or false by circling the appropriate T (true) or F (false).

T F 1. Though it is not common, transmission of syphilis can occur from the oral lesion of an infected patient to the hand of a technician.

T F 2. Syphilis is caused by a specific bacteria called *Treponema pallidum.*

T F 3. The chancre, which characterizes the first stage of syphilis, very rarely appears in the mouth; however, when it does, it leaves a telltale scar.

T F 4. Normally, multiple lesions (chancres) appear in the mouth during the first stage of syphilis.

T F 5. Clinical diagnosis of secondary syphilis is difficult, because secondary lesions often have different appearances.

T F 6. The lesions which appear during the third stage of syphilis are usually the most contagious.

T F 7. The secondary lesion of syphilis normally appears from 2 months to 1 year after the primary lesion has disappeared.

T F 8. The lesion of the second stage of syphilis is called a gumma; that of the third stage is called a chancre.

T F 9. The dentist and technician should view any painless lesion of the mouth or throat with suspicion of being possibly related to syphilis.

T F 10. Treatment of syphilis, regardless of stage, is a medical problem.

222. State specific factors concerning the oral manifestation of tuberculosis, and indicate the patient management procedures required when treating infected patients.

Tuberculosis. The oral lesions in this disease are usually associated with pulmonary (lung) tuberculosis. The primary causative agent is the bacillus *Mycobacterium tuberculosis.* The spread of the oral cavity occurs either through the blood stream or by direct contamination of an abrasion or wound in the mucosa. The most common site for this secondary tuberculous lesion is on the tongue. If the oral lesion is a primary site, it may be caused by the direct contact of the tissue with an infected instrument.

Oral lesions, especially those of the lips, frequently begin as a small tubercle or pimple, which breaks down to form painful ulcers. Additional tubercles form in the same manner—the process repeats over and over and the lesions grow in size. The tongue lesions are particularly painful as they develop along the lateral borders of the tongue where it rubs against rough, sharp, or broken down teeth and restorations. The pain is severe and continuous, and it interferes with eating.

The patient suffering from this disease is in serious trouble. Management is a medical problem. The oral lesions are treated in the closest cooperation with a physician. The maintenance of good oral hygiene and the elimination of all areas that might be a source of irritation to the tissues is the primary dental concern. During the dental portion of treatment of diseases such as this, where contact with the lesion could spread the infection to the operator, rubber gloves and the strictest aseptic techniques are *mandatory.*

Exercises (222):

1. What is the primary causative agent of tuberculosis?

2. Indicate three methods by which the tuberculosis bacilli can be spread to or in the oral cavity.

3. What is the most common site for the secondary tuberculous lesion?

4. Breifly explain how the painful tuberculous ulcers develop and spread.

5. What is the dental primary concern in the treatment of the tuberculosis patient?

6. What precautions should be observed by dental personnel who are involved with the treatment of a tuberculosis patient?

223. Differentiate between the etiology and oral manifestations of measles and mumps.

Measles. Measles is seldom dangerous but is highly contagious. If you have not already had this disease, then you are not immune, and you should stay completely away from an infected patient. Measles is a viral infection that usually produces lasting immunity once a person has had the disease.

One of the earliest signs of rubeola (measles) is Koplik's spots, an important diagnostic sign of the disease. They appear 1 or 2 days before the rash. The spots are pinhead size and white or bluish-white, surrounded by a red halo, usually found early on the soft palate, and later, during the acute stages of the disease, on the cheek mucosa along the line of closure in the molar region.

The disease will run its course in 14 to 21 days. Unless there are oral complications, measles is treated as a medical problem by a physician.

Mumps. Mumps, although primarily a viral infection of the parotid salivary gland, is considered a systemic disease because it also may affect the testicles, ovaries, pancreas, and brain. This acute, highly contagious disease should be viewed with suspicion by those who have never had the disease. Mumps must be differentiated from acute oral infections and cellulitis. Mumps is a highly contagious viral disease that usually imparts a lasting immunity to those who have been infected.

Patients with swellings located at the angle of the mandible may be infected by this virus. Accompanying symptoms include irritability, fever, and headache. The swollen area is extremely sensitive to palpation. The medical clinic manages this condition.

Exercises (223):

Match each term in column A with the letter of any statement in column B that is appropriate to that term. Some statements are applicable to both terms.

Column A

____ 1. Measles.
____ 2. Measles.
____ 3. Measles.
____ 4. Measles.
____ 5. Mumps.
____ 6. Mumps.
____ 7. Mumps.
____ 8. Mumps.

Column B

a. A viral contagious disease.
b. Runs its course in 14-21 days.
c. Usually imparts lasting immunity.
d. May also affect the testicles, ovaries, pancreas, and brain.
e. Accompanied with swelling at angle of mandible and possible with irritability, fever, and/or headache.
f. Pinhead size, white or bluish-white Koplik's spots, surrounded by a red halo, appear on the soft palate as an early sign

224. Identify specific factors related to patients with diabetes.

Diabetes Mellitus. This disease is due to insufficient secretion of insulin by the pancreas. Insulin is needed by the body for the digestion and use of carbohydrates. The cause is unknown, but patients who eat too much sugar and fat, are overweight, get little or no exercise, or have some disease of the pancreas itself, have a greater tendency to develop diabetes.

Patients usually experience xerostomia (dry mouth) and sweetish odor to the breath. Diabetes mellitus impairs the body's healing ability. This factor causes diabetics to have increased tendency to develop periodontitis, glossitis, and gingivitis. They also develop infections easily. If oral surgery is performed, the patients usually exhibit healing difficulties and are often predisposed to alveolar osteitis.

Diabetes is a medical problem. It is not curable but can be controlled in most cases by oral medication or insulin injection. If a patient is a controlled diabetic, his reactions to surgery and his healing functions are about the same as that of a normal patient.

Exercises (224):

Indicate whether each of the following statements is true or false by circling the appropriate T (true) or F (false).

T F 1. Diabetes mellitus is a disease due to the insufficient secretion of insulin by the parotid gland.

T F 2. Patients who eat too much sugar and fat, are overweight, get little exercise, or have some disease of the pancreas have a greater tendency to develop diabetes.

T F 3. Diabetics usually exhibit healing difficulties and are often predisposed to alveolar osteitis following surgical procedures.

T F 4. Diabetics have a greater resistance to periodontitis, glossitis, and gingivitis.

T F 5. Diabetes is not curable, but in most cases it can be controlled by oral medication or insulin injection.

225. Differentiate between the clinical signs, symptoms, and treatment of vitamin B complex malnutrition and vitamin C deficiency.

Oral Manifestations of Nutritional Deficiencies. Oral lesions due to poor diet are relatively rare in the military patient. Patients with diets that are deficient in one or more vitamins still appear in the clinic. However, most of these deficiencies are due to the omission of certain foods from their diet because of habit or personal taste. The avitaminoses (conditions due to the lack of specific vitamins) can produce acute problems in the oral cavity. For the dental technician, it is a matter of recognition of abnormal textures and color. Nutritional disturbances are best managed by the medical facility. Only a brief representative group of these disturbances will be discussed.

Vitamin B complex malnutrition. Several lesions can appear in the oral cavity from a diet deficient in this group of vitamins. Angular cheilosis is the cracking of the corners of the mouth with accompanying pain due to irritation from foods and saliva. This condition must be differentiated from angular chei*litis,* which is chapping due to increased salivation or secondary infection of cracks in the corners of the mouth. Overclosure of the bite due to loss in vertical dimension of dentures can be a contributing factor to cheilitis. Cheilitis is a lesion due to local irritation, whereas cheilosis is due to the vitamin B complex nutritional disturbance.

Prolonged deficiency of complex vitamins causes the tongue to enlarge, resulting in a glossy or smooth texture. The fiery red appearance is also due to insufficient vitamin B. Medical management usually includes increasing the daily intake of the B complex vitamin group.

Vitamin C deficiency. A prolonged vitamin C deficiency produces scurvy. This once common condition is now found only in patients with restricted diets. Unless the condition persists for a long period of time, the most signficant oral aspect of vitamin C deficiency is the impaired ability to heal and some gingival bleeding. Detectable changes in the periodontal structures supporting the teeth occur only after extended vitamin C deficiency. Treatment is the administration of ascorbic acid (synthetic vitamin C).

Exercises (225):

Match the descriptive statements in column B to the conditions listed in column A.

	Column A		*Column B*
___	1. Vitamin B complex malnutrition.	a.	A prolonged deficiency produces scurvy.
___	2. Vitamin B complex malnutrition.	b.	Deficiency may result in angular cheilosis with accompanying pain due to irritation.
___	3. Vitamin C deficiency.		
___	4. Vitamin C deficiency.	c.	Treatment is the administration of ascorbic acid.
___	5. Vitamin C deficiency.	d.	Most significant oral aspect is impaired healing ability and some gingival bleeding.
		e.	A prolonged deficiency causes the tongue to enlarge and appear fiery red and glossy.

226. Name two classes of burns, indicate their likely causes, and tell what precautions might prevent them.

Oral Lesions of Local Origin. Considering the number of functions performed by the mouth and associated structures, the mouth is a magnificent part of the body. The oral cavity is abused with pencils, fingernails, caustic drugs, and hot and cold foods. It often inflicts wounds upon itself with lip and cheek biting. It is evident that all this abuse sometimes causes damage. The damage may be reparable or may cause permanent defects. Some of the agents of abuse can lead to serious problems and even loss of life. The most common oral lesions will be discussed according to cause. Most of these problems can be avoided, since they are nearly all manmade.

Thermal burns. Severe burns are rare in a dental clinic. The oral cavity is relatively inaccessible to heat hazards. The mucosa also has some built-in protection by virtue of its moist surface. Combat personnel occasionally receive flash burns, and a resultant severe sloughing of tissue occurs. Minor burns occasionally occur from hot foods on the labial and palatal mucosa. Most burns due to heat are avoidable.

Burns may be caused by careless handling of heated dental materials and instruments. If a technician uses instrument forceps to hand an instrument directly from a hot sterilizer to a doctor who is wearing rubber gloves, the patient may be injured before the doctor detects the temperature of the instrument. It is also likely that the patient will be anesthetized and therefore not be able to give a warning.

Careless manipulation of hot dental materials, such as impression waxes and endodontic instruments, constitutes a hazard. All such materials and instruments should be kept away from the patient and not brought to the operating area until they are within safe temperature range. Oral mucosa reacts the same, regardless of the source of heat—liquid, metal, or gas. The tissue protein of the mucosa coagulates and usually turns white and sloughs off, leaving an ugly raw wound that heals with difficulty and pain.

Chemical burns. The use of chemicals in dentistry is widespread. Many chemicals in the dental office are designed to be used on the hard tissue of the teeth and are quite caustic in soft tissues. These chemicals must be handled with extreme caution. Patients sometimes self-inflict chemical burns by placing an aspirin tablet in the mucobuccal fold next to the tooth that hurts. This does not cure the toothache but does cause a severe chemical burn. This burn often becomes a greater problem than the toothache itself. The aspirin burn may be severe enough in cases to expose bone and open a pathway for a painful infection. Some of the common agents that cause chemical burns are given below.

a. Aspirin. Moisture changes acetylsalicylic acid into acetic acid and salicylic acid. The result of placing aspirin against the mucous membrane of the oral cavity is a severe chemical burn. The mucosa turns white in the area covered by the tablet and usually sloughs off, leaving an ulcer difficult to treat. The patient must be questioned to determine the cause of the lesion. To avoid being part of this problem, when aspirin is prescribed for a patient, it should be emphasized that the tablet must be *swallowed* to give the beneficial effect intended.

b. Eugenol. This chemical is refined oil of cloves and is quite valuable in dentistry. Used properly, it is most beneficial, but it will burn soft tissue—although not as severely as aspirin.

c. Phenolic compounds. There are many compounds of phenol (carbolic acid) used in dentistry. Many of them have the same name but different strengths. They should be handled with extreme care, since they are very caustic.

d. Other caustics. Most dentists will have a selection of compounds that are needed to support the operations they perform. No attempt will be made here to anticipate all of these requirements. The following general instructions should be adhered to by each dental technician who handles caustics:

- Know the contents of all the medicament bottles in the operatory.
- Be able to describe the properties of these substances and precautions necessary for handling, neutralizing, and storing them; for example, some require refrigeration, others the absence of sunlight, etc.
- Label all containers.
- Make positive identification of all drugs and chemicals.
- Be very careful in handling all chemicals.

Exercises (226):

1. Name the two classes of burns.

2. Which class of burn may be caused by the careless handling of heated dental materials and instruments?

3. How can you help to avoid thermal burns?

4. How do patients often receive self-inflicted chemical burns?

5. When aspirin is prescribed, what instructions should you give to the patient to avoid chemical burns?

6. Restate the instructions that should be adhered to by each dental technician who handles caustics.

2-4. Bone Lesions

Bone lesions are divided into two categories—those that result from trauma and those that are pathological. Because the bony framework of the head contains the brain and the food and air passages, it is important that any bone lesion be promptly identified and treated.

227. Given a series of statements concerning traumatic bone lesions, determine which are true and which are false.

Traumatic Lesions. Traumatic lesions are actually fractures induced by trauma. Dental management of fractures deals primarily with the facial bones. Steps must be taken to heal the fracture and restore the proper function. Fractures of the jaw are the most common reason for hospitalization of dental patients.

Other than the circumstances of emergency first aid, the dental technician's primary involvement with facial fractures is in the capacity of assistant to the dentist who is treating the patient in order to identify the fact that a fracture exists; specific signs and symptoms can be noticed. Patients who exhibit the characteristics discussed below should be considered fracture patients until determined otherwise.

Trauma. Wounds, swellings, and discoloration of the face, with a history of trauma to the site, should suggest the possibility that bones may be broken. Necessary precautions should be taken to prevent further injury. Bruising and the escape of blood under the skin is indicative of blows that may be severe enough to break bones. Sometimes the broken bones can be seen or felt.

Pain. Pain, severe tenderness, and grating under the skin are good indications that a mobile bone fragment is present in that area.

Abnormal appearance. Facial asymmetry and luxation (dislocation), in which the normal appearance of the patient is changed, indicate complete fractures. Diplopia (double vision) may occur if the bones forming the floor of the orbit are involved. Sunken areas or abnormal projections should also increase the suspicion of fractures.

Abnormal movement. Abnormal mandibular movements occur when muscles displace fragments of the bone fracture, or the continuity of the jaw is broken so that it does not swing from the temporomandibular joint but from the fracture site. The most noticeable movement indicative of a fracture is deviation of the jaw to one side or another when the patient opens and closes his mouth.

Malocclusion. Malocclusion may be quite noticeable to the patient with a fractured jaw. The bite will correspond to the deviation of the mandible. Since the mandible will swing toward the side of the fracture, the teeth will usually strike on that side first when closing. Sometimes, all of these signs and symptoms are present. Regardless of how many conditions are noticed, they should be noted and brought to the attention of the dentist, who will confirm the fracture with further examination and X-rays.

Exercises (227):

T F 1. Traumatic lesions are actually fractures induced by trauma.

T F 2. Fractures of the jaw are the most common reason for hospitalization of dental patients.

T F 3. A patient should never be considered as a fracture patient until the fracture has positively been verified.

T F 4. Bruising and the escape of blood under the skin is not generally indicative of blows severe enough to break bones.

T F 5. Pain, severe tenderness, and grating under the skin are good indications that a mobile bone fragment is present in that area.

T F 6. Diplopia (double vision) usually occurs with fractures of the body of the mandible.

T F 7. Facial asymmetry and luxation, in which the normal appearance of the patient is changed, indicate complete fractures.

T F 8. Malocclusion may be quite noticeable to the patient with a fractured jaw.

T F 9. The most noticeable movement indicative of a fracture is deviation of the jaw to one side when the patient opens or closes his mouth.

228. State why early stabilization of fractures is desired, indicate stabilization method of choice, and briefly describe the wiring, head-bandage technique.

Immobilization of fracture patients. Immobilization of fractured elements has vital therapeutic implications. Although the dental technician will probably not be required to stabilize facial fractures, he should be able to anticipate the needs of the dentist and give prompt, accurate assistance.

Early temporary stabilization aids in the control of shock, infection, pain, swelling, trismus, and hemorrhage. It also has a direct bearing on the reestablishment of a normally functioning masticatory system and on the esthetic result. Since many maxillofacial cases are not seen by an oral surgeon until they arrive at a major treatment center, other medical personnel are therefore responsible for applying early temporary stabilization. A simplified technique of intermaxillary fixation (stabilizing the maxilla and the mandible by wiring them together), supplemented by a head bandage for support of the mandible, is the method of choice for attaining temporary stabilization.

The wiring, head-bandage technique is accomplished as follows: pass a 2-inch length of stainless steel wire around the neck of a tooth that has been selected for wiring (see fig. 2-4). In maxillary fractures, the intact mandible is used as a splint, against which the segments of the maxilla are repositioned and immobilized. In mandibular fractures, the intact maxilla is used as the splint. At least two posterior teeth in each quadrant are selected for wiring. Each of these teeth should be firm and have an opponent in the opposite arch: that is, the biting surface of the upper tooth selected for wiring should contact the biting surface of the lower tooth when the jaws are brought together. Twist the ends together tightly with a hemostat to prevent its slipping over the crown. Cut the twisted wire one-half inch from the tooth and fold it back against itself to form a tight loop. Bend the loop back toward the gingiva to form a hook to attach the elastics. Form similar loops on all of the teeth selected for wiring, and anchor small intermaxillary elastic bands on these curved loops so that the forces tend to bring the upper and lower jaws

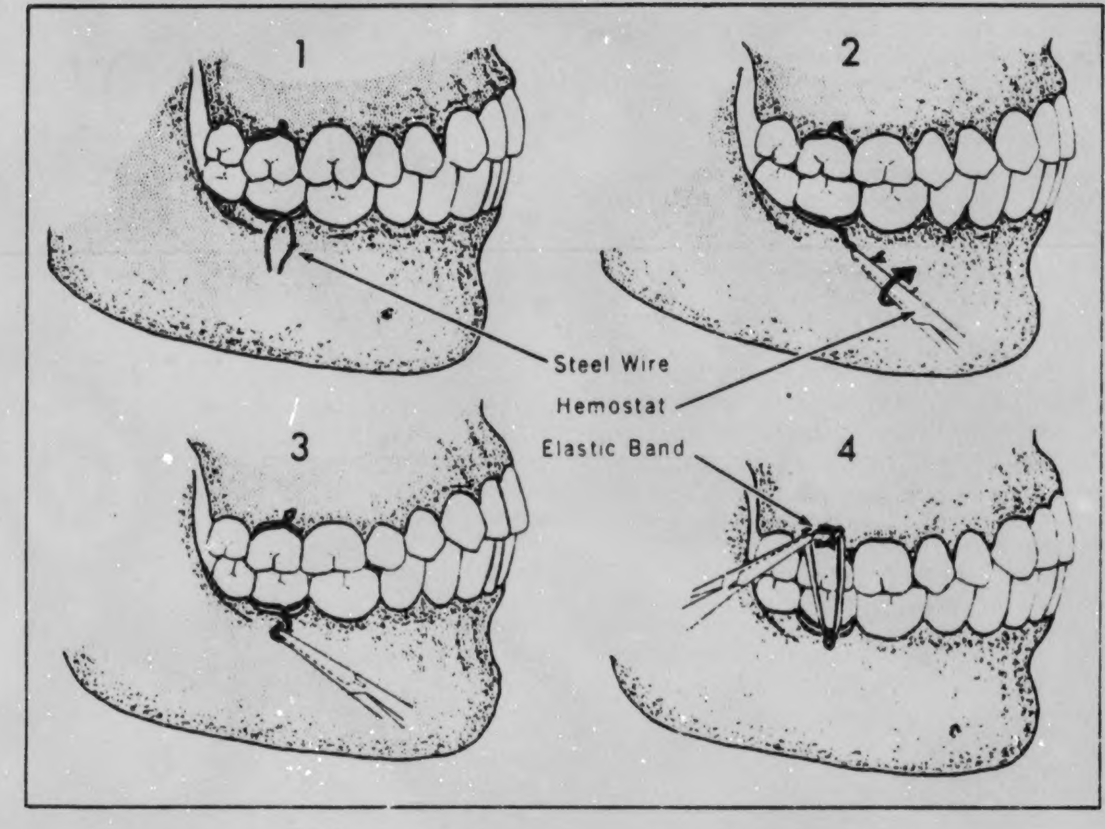


Figure 2-4. Wiring—head-bandage technique

together. Apply the supplemental bandage as shown in figure 2-5. If a limited armamentarium precludes stabilization by intermaxillary traction, a head bandage alone may be employed. The head bandage by itself is less effective than when combined with the intermaxillary elastic traction, but it is beneficial in providing gross stabilization, especially when both maxilla and mandible are fractured.

Exercises (228):

1. Why is the early temporary stabilization of fractures desired?

2. What is the method of choice for attaining temporary stabilization?

3. Briefly describe the wiring, head bandage technique.

229. Given a series of statements concerning the transportation of fracture patients, determine which are true and which are false.

Transportation of fracture patients. The air evacuation of patients with facial trauma is an important aspect of aerospace medicine. Dental technicians may be called upon to assist in preparing and receiving patients with fractured facial bones that require stabilization.

If the fracture patient is to be transported, precautions must be taken to protect him against motion sickness. This is important, since such a patient could easily suffocate from his own vomitus. Preparations include preparing the patient psychologically for the trip to alleviate his apprehension or fear, prescribing antimotion sickness drugs, and preparing for the removal of the fracture fixation if vomiting should occur. Regulations prohibit transporting patients with fixed intermaxillary wiring. The arches must be fixed together with elastics, which are much easier to remove. Scissors suitable for cutting intermaxillary elastics are attached to the patient so that they are readily available if needed.

A quick release mechanism for jaw fixation

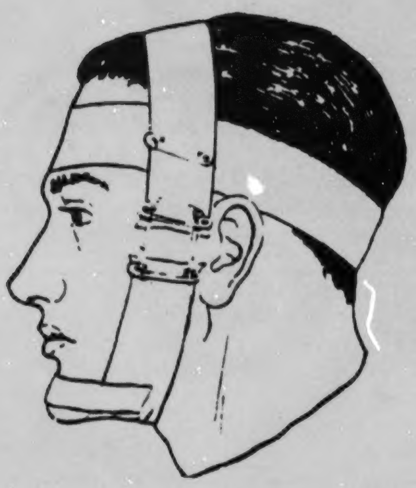


Figure 2-5. Head bandage for stabilization

should be constructed from wire or dental floss as shown in figure 2-6. Simply loop the wire or floss through the elastic fixation banks and tape the end to the patient's cheek. When immediate release from fixation is needed, either the patient or attendant can pull the wire and free the elastic bands.

Exercises (229):

T F 1. Regulations require that patients being transported have fixed intermaxillary wiring.

T F 2. Scissors suitable for cutting intermaxillary elastics should be kept in the emergency kit.

T F 3. Precautions must be taken to protect fracture patients who are about to be transported from motion sickness.

T F 4. A quick release mechanism for jaw fixation can be constructed by looping wire or dental floss through the elastic fixation banks and taping the end to the patient's cheek.

230. Delineate the etiology, signs, symptoms, and treatment of the alveolar osteitis bone lesion.

Pathological Lesions. Pathological bone lesions are any lesions that affect the bone. We have already discussed many of these, such as inflammatory and developmental cysts, abscesses, and granulomas. A pathological bone lesion, which is frequently seen in the dental clinic, is alveolar osteitis.

Alveolar osteitis is an extremely painful condition that results when a normal blood clot fails to form or is dislodged. Pain may occur immediately after the extraction or may be delayed for 2 or 3 days. Pain normally becomes increasingly acute after the third day and remains severe for several days without treatment and medication. Examination of the socket usually indicates that a portion of the alveolar bone is exposed and infected; hence, the name "dry socket." The socket usually has a foul odor, and the surrounding tissue is inflamed.

Although the treatment of a dry socket may vary, it often consists of irrigating the socket with warm saline and packing the socket with iodoform gauze saturated in eugenol. The gauze is packed lightly into the socket to provide sedative action without interfering with healing. Sedatives and/or analgesics may be prescribed to relieve pain and possible insomnia.

Exercises (230):

1. Under what conditions is alveolar osteitis likely to occur?

2. When does the pain from alveolar osteitis become increasingly acute?

3. During alveolar osteitis, what does an examination of the socket usually reveal?

4. What treatment is often used to treat a "dry socket"?

2-5. Other Oral Diseases and Conditions

There are certain other oral conditions of which you should be aware. Some result from trauma or wearing, while others result from disease. In this section we discuss tumors, hypoplasia, erosion, resorption, abrasion, and attrition.

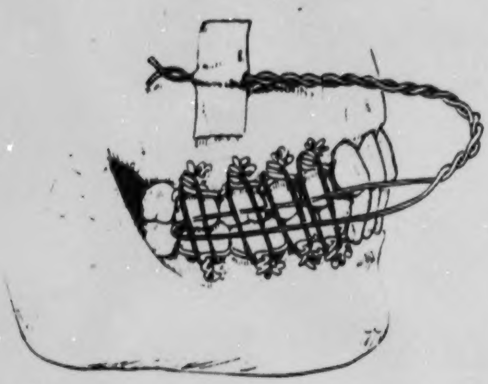


Figure 2-6. Quick release mechanism.

231. Given a series of descriptive definitions, identify the various types of tumors and the terminology which applies to them.

Tumors. The word "tumor," which means a swelling, is used to describe an abnormal growth of tissue. The terms "non-neoplasms" and "neoplasms," meaning new formations, can, however, more accurately describe the pathological conditions.

Non-neoplasms. Non-neoplasms are different from true neoplasms in that the etiological factor can be identified. We have already discussed many overgrowths that are classified as non-neoplasms. These include the overgrowth of gingiva due to mechanical or bacterial irritants, granulomas, dental abscesses, and cysts.

Neoplasms. Neoplasms are uncontrolled new growths without an immediate cause. They possess the potential for unlimited growth and are of no use to the body. The simplest way to discuss them is to classify them as either epithelial neoplasms or supporting tissue neoplasms. Within both groups are malignant and benign types. Malignant neoplasms are referred to as cancers. Look at table 2-2, and compare the characteristics of benign and malignant neoplasms.

a. Epithelial neoplasms are abnormal growths of epidermal embryonic origin. Neoplasms of the skin and associated structures, including most glands, are in this group. Cancers of the skin are referred to as carcinomas; cancers of the glands are referred to as adenocarcinomas. A malignant lesion of the parotid gland would be called an adenocarcinoma of the parotid gland. A similar lesion affecting the mucosa of the palate would be called a carcinoma or epidermoid carcinoma of the palate. Benign overgrowths may have descriptive names but usually contain the suffix "oma." A benign neoplasm of the parotid gland is called an adenoma of the parotid gland. A benign lesion of the palate may be described a bit further as a papilloma, meaning that it is raised and resembles a wart. Warts are epithelial papillomas.

b. Supporting tissue neoplasms are abnormal growths of tissue of mesodermal embryonic origin. Neoplasms of the bony skeletal system and cartilage are included in this group. Cancers of the bone are termed "osteosarcomas" ("osteo" or "bone"—"sarcoma" or "malignant neoplasm of"). Benign growths of supporting tissue are named by the same system used in the epithelial tumors. The benign tumor or bone is an osteoma. Two common bony tumors of the mouth are the "torus mandibularis" and the "torus palatinus." These terms are examples of older nomenclature still in use and often given to benign lesions. Torus means "a bulging." These neoplasms are actually osteomas. They are quite benign and need only be removed if they interfere with prosthetic appliances or bother the patient.

Exercises (231):

In the following exercises, match the type of tumor listed in column A with its most appropriate descriptive definition in column B by writing the letter you choose in the blanks provided. Use every descriptive definition once, and once only. Match every term in column A but once.

Column A	*Column B*
____ 1. Tumor.	a. Uncontrolled new growths without an immediate cause.
____ 2. Neoplasm.	b. A malignant lesion (cancer) of the glands.
____ 3. Non-neoplasms.	c. Abnormal growths of tissue of mesodermal embryonic origin.
____ 4. Epithelial neoplasms.	d. A new formation where the etiological factor can be identified.
____ 5. Carcinomas.	
____ 6. Adenocarcinomas.	
____ 7. The suffix "oma" added to a descriptive name.	

TABLE 2-2
COMPARISON OF BENIGN AND MALIGNANT NEOPLASMS

Benign	*Malignant*
Grows slowly by enlargement.	Grows rapidly by invasion.
Confined or encapsulated.	Not confined; borders ill defined.
Does not metastasize (the transfer of disease from one organ or part to another not directly connected with it).	Metastasizes through the circulatory system to form a new foci of the disease.
Not likely to recur after removal.	May recur after removal.
Resembles parent tissue.	Does not resemble parent tissue.
Usually does not cause death.	Can cause death if not treated early.

Column A	*Column B*
____ 8. Supporting tissue neoplasms.	e. Abnormal growths of epidermal embryonic origin.
____ 9. Osteoma.	f. Word termination meaning "tumor" or "neoplasm" of the part to which it is attached—usually used to indicate a benign growth.
____ 10. Torus mandibularis.	g. Means a swelling, describes an abnormal growth of tissue.
____ 11. Benign.	h. A bulging bony tumor of the mouth (specifically, on the lingual surface of the mandible).
____ 12. Malignant.	i. A hard tumor of bone-like structure developing on a bone.
	j. Malignant neoplasms.
	k. Tending to become progressively worse.
	l. Not malignant; favorable for recovery.

232. Given a series of statements concerning definition, severity, and etiology of hypoplasia, determine which are true and which are false.

Hypoplasia. A temporary disturbance in the formation of enamel matrix results in *hypoplasia* ("hypo-" means "under" and "-plasia" means "formation"). This condition results from disturbances during the formation of the calcified tissues—a period extending from the sixth week of embryonic life until about the fifteenth year of age. Occasionally, a disturbance affects a single tooth, but usually it affects several. The position of defects on each tooth indicates the stage of development of that tooth at the time the disturbance occurred.

The degree of hypoplasia varies from mild to severe, depending upon the character and severity of the disturbance. In mild cases, there are small patches of poorly calcified enamel and an increase in uncalcified areas of the dentin. In severe cases, all or a part of the enamel fails to develop. Between these extremes, there is a wide range of forms.

Systemic causes of hypoplastic disturbances include the following:

(1) Acute eruptive fevers, such as smallpox, diphtheria, measles, and scarlet fever.

(2) Vitamin deficiencies, principally of vitamin D, and also of vitamins A and C.

(3) Mineral deficiencies, especially of calcium and phosphorus.

(4) Excess of fluoride.

(5) Disturbances in endocrine gland function.

(6) Congenital defects.

(7) Local disturbances.

Some local disturbances also cause hypoplasia; these include traumas, infections, and tumors.

Acute eruptive fevers. The acute eruptive diseases usually occur during childhood when the teeth are being formed, and affect their development. The toxins produced in these diseases attack epithelial tissue, and since enamel is of epithelial derivation, many of the enamel-forming cells (ameloblasts) cease to function. Therefore, areas of the teeth that develop during the course of the disease are defective. The affected cells do not recover, but after the disease is cured, new ameloblasts develop adjacent to them. When the new cells begin to form enamel, the defective areas that developed during the disease are partially covered and repaired, but hypoplastic defects will usually be visible when the tooth erupts. Enamel pits, varying in size, may be visible on the surface of the enamel, or there may be ridges on the enamel. The same defects may be seen in hypoplasia caused by vitamin or mineral deficiencies.

Vitamin deficiencies. Rickets is a nutritional disease caused by lack of vitamin D. Since vitamin D regulates calcium-phosphorus metabolism indirectly, through the parathyroid glands, rickets affects the development of the teeth, as well as the development of the bones. When rickets occur while the teeth are developing, enamel hypoplasia frequently results, and irregular dentin is formed. If the condition is very severe, none of the ameloblasts develop, and the crown of the tooth is composed of dentin only. The tooth eruption may be delayed.

Vitamin A deficiency affects epithelial tissue. A severe deficiency therefore interferes with the formation of enamel and dentin in the same manner as do the acute eruptive fevers.

Vitamin C deficiency during the earliest stages of tooth formation prevents the differentiation of the odontoblasts. If the deficiency occurs after the odontoblasts have formed, it causes them to atrophy and degenerate. Irregular dentin formation results. When the deficiency is severe, it also causes the ameloblasts to degenerate, and secondary enamel hypoplasia results.

Mineral deficiencies. Where actual deficiencies of calcium and phosphorus exist, connective tissue cells in the dentinal papillae proliferate (grow by rapid reproduction) between the ameloblasts. This may produce small areas of hypocalcification (deficient calcification of the matrix) between enamel rods that appear only as one or more small whitish spots on the tooth surface. The ameloblasts may also degenerate. In addition, the dentin may be poorly calcified.

A deficient amount of magnesium causes degeneration of the epithelial tissue. Normal calcification of the teeth also requires small quantities of sodium, potassium, chlorine, and fluoride.

Excess of fluoride. Excessive amounts of fluoride in drinking water cause disturbances in the processes of matrix formation and calcification that may result in large areas of poorly formed enamel. The condition is called *dental fluorosis*. It has also been called enamel fluorosis or *mottled enamel*. Chalky or pitted areas, or opaque white, brown, or even black mottling may appear on the tooth surfaces. The symptoms may range from a few small white spots on one or more teeth to extensive disfigurement of nearly all tooth surfaces, and some teeth may not form at all. The severity of the condition depends upon the amount of fluoride in the drinking water. As little as two parts per million of fluoride in the drinking water of an area causes mild symptoms in about half the population.

Laboratory experiments have shown that noncarious teeth contain more fluoride than carious teeth. Teeth affected by even minimum degrees of fluorosis that do not change their clinical appearance are less susceptible to caries. Persons whose drinking water during the period from birth until after the permanent teeth have erupted contains a very small quantity of fluoride (approximately one part per million) have from 50 to 65 percent less dental caries than persons whose drinking water is free from fluoride during the same period. Since fluoride continues to be deposited on the outer surfaces of the teeth for a time after they have erupted, topical application of fluoride to children's teeth also reduces the incidence of caries.

Disturbances in endocrine gland function. Sometimes dysfunction of the thyroid, parathyroid, and pituitary glands seriously interferes with tooth development. Dysfunction of the adrenal and sex glands may influence such development to a lesser degree. Retarded eruption, malposition of the teeth, dwarfed teeth, malocclusion, and defects in the attachment apparatus may be caused by dysfunction of the endocrine glands. Dysfunction of the parathyroid glands may produce an alteration of calcium and phosphorus metabolism, even when the body has an adequate supply of those minerals and of vitamin D.

Congenital defects. Disturbances occurring during the embryonic or fetal stages of development are called congenital disturbances. Tooth development is seldom affected before birth except by a very serious disease, and when it is, the defects usually appear on the deciduous teeth. It has been found that when the mother has rubella (commonly called German measles) during pregnancy, the child's deciduous teeth may be hypoplastic when they erupt. If the disease occurs during the first 3 months of embryonic life, some teeth may fail to develop.

Congenital hypoplasia may result from activity of the causative organism of syphilis, *Treponema pallidum*. When a mother has syphilis during pregnancy, she may transmit the disease to her child. In particular, the teeth show the effects of this transmission. The maxillary incisors appear notched at the incisal edge and are barrel-shaped; or they may be wedge-shaped, with the base of the wedge at the cervical line. Look at figure 2-7 to see a comparison of two maxillary incisors. One has been affected by congenital syphilis (Hutchinson's disease), while the other is a normal tooth. In some instances, the cusps of the first permanent molar may be mulberry-like in form. However, it must also be determined that other syphilitic (luetic) symptoms are present before making a definite diagnosis of congenital syphilis.

Local disturbances. Local disturbances that may produce forms of hypoplasia are traumas, infections, and tumors. Trauma, such as would result from a blow or a fall, might kill or displace some of the ameloblasts or odontoblasts during tooth formation. Then, absence of part of the enamel and dentin may result. A microscopical change in the appearance of the dentin can follow, caused by an altered position and course of the dentinal tubules, or a change in the character of the calcified matrix. In infections, the bacteria may cause the death of some or many of these cells and produce the same defects we have been discussing. Tumor masses, such as cysts, interfere with normal calcification processes, and parts of the teeth may not form.

Exercises (232):

T F 1. Hypoplasia means overformation.
T F 2. Disturbances in the formation of calcified tissues may occur from the sixth week of embryonic life to 15 years of age.
T F 3. In severe cases of hypoplasia, all of the tooth's enamel may fail to form.
T F 4. Acute eruptive fevers can cause hypoplasia when the toxins of the disease

HUTCHINSON'S INCISOR
NORMAL INCISOR

Figure 2-7. Hutchinson's incisors.

attack the epithelial tissues and cease the function of many of the ameloblasts

T F 5. Rickets result from a lack of vitamin A and may cause the formation of irregular dentin.

T F 6. Vitamin C deficiency during the early stages of tooth formation prevents the differentiation of the odontoblasts, and when severe may also cause the ameloblast to degenerate.

T F 7. Small whitish spots on the tooth's surface may result from hypocalcification caused by deficiencies of calcium and phosphorus.

T F 8. Chalky or pitted areas, or opaque white, brown, or even black mottling (mottled enamel) are often the result of mineral deficiencies.

T F 9. As little as one part per million of fluoride in the drinking water causes mild symptoms of dental fluorosis in about half the population.

T F 10. Retarded eruption, malposition of the teeth, dwarfed teeth, malocclusion, and defects in the attachment apparatus may be caused by dysfunction of the endocrine glands.

T F 11. Disturbances occurring during the embryonic or fetal stages of development are called congenital disturbances.

T F 12. If a mother has German measles during her first 3 months of pregnancy, the child's deciduous teeth may be hyperplastic, and some teeth may fail to form.

T F 13. Congenital hypoplasia may result in a child whose mother had syphilis during pregnancy; however, this condition causes malformation of the palatal bone and not the teeth.

T F 14. Trauma, such as would result from a blow or fall, could cause hypoplasia by killing or displacing some of the ameloblasts or odontoblasts during tooth formation.

233. Differentiate between abrasion and attrition.

Abrasion and Attrition. Both abrasion and attrition mean the loss of substance of a tooth from wearing processes. In abrasion, one or more teeth may show wear, generally brought about by biting foreign objects, such as a pipestem thread, or bobbypins Wrong use of the toothbrush or nervous biting habits will also cause abrasion. In attrition, the wear involves all the teeth and is considered a normal loss of tooth substance due to the mastication of food. The extent of attrition depends on the hardness of the enamel, as well as on the diet. A regular diet of coarse, rough foods requires long and forceful chewing and, therefore, causes more extensive attrition than a diet of soft, well-cooked foods. In normal attrition, the cusps and contact points of all teeth show uniform wear.

In both abrasion and attrition, the dentin under the worn areas may become *sclerosed;* that is, the dentinal tubules become calcified, and secondary or irregular dentin may be deposited in the pulp immediately below the area. The pulp is more often damaged by abrasion than by attrition. A possible explanation is that the foreign body or other cause of abrasion wears down the tooth structure so rapidly in certain areas that the tooth is unable to provide a suitable defense. In attrition, slower and more equally distributed wear takes place. This enables the pulp to act by calcifying the dentinal tubules and depositing secondary dentin at a rate equivalent to the destructive process. In both abrasion and attrition, secondary cementum may be laid down about the roots of the teeth. In abrasion, the deposition may be uneven because abnormal forces are brought to bear upon the tooth; whereas in attrition, it will be uniform unless the teeth are malocclude.

When teeth show normal attrition, the periodontium is stronger and wider. Also, the teeth are less susceptible to pit and fissure caries because the pits and fissures become shallow, and debris cannot accumulate in them.

Exercises (233):

Differentiate between abrasion or attrition by matching the statement in column B to the appropriate terms in column A. Some statements may be matched to both terms.

Column A

____ 1. Abrasion.
____ 2. Abrasion.
____ 3. Abrasion.
____ 4. Abrasion.
____ 5. Abrasion.
____ 6. Attrition.
____ 7. Attrition.
____ 8. Attrition.
____ 9. Attrition.
____ 10. Attrition.
____ 11. Attrition.

Column B

a. The loss of tooth substance from the wearing process.
b. The dentin under the worn areas may become sclerosed.
c. The condition that most often causes pulp damage.
d. Normally the cusps and contact points show uniform wear.
e. May result in secondary dentin being laid down about the roots of the teeth.
f. When normal, the peridontium is stronger and wider, and the teeth are less susceptible to decay.
g. A normal loss of tooth structure due to the mastication of food.
h. May be caused by biting on foreign objects or improper toothbrushing.

1.15

234. Given statements concerning the characteristics, etiology, and treatment of erosion, determine which are true and which are false.

Erosion. Erosion is a loss of tooth substances from areas not subject to attrition, usually the facial surfaces of teeth. This wedge-shaped defect occurs most often on the gingival third of the crown, usually at the cemento-enamel junction. The enamel and dentin at the base of the lesion are smooth, hard, and glistening, and the enamel is not undermined as it is in dental caries. The area looks as if it has been cut with a file or bur and then polished. Although improper toothbrushing is suspected, this type of erosion is called idiopathic erosion because the exact cause is not known.

Acid erosion results from the therapeutic use of acid for gastric diseases. The defects occur on any surfaces of the teeth that are in frequent contact with the acid. The acid decalcifies the enamel, and when the dentin is exposed, it wears rapidly. Those who suck lemons frequently may develop acid erosion on the facial surfaces of the incisors.

During the early stages of erosion, the eroded areas are very sensitive to heat and cold, to acid foods, and to brushing, but sensitivity decreases when secondary dentin is formed. Relief of pain can be achieved through topical applications of sodium fluoride paste.

Exercises (234):

T F 1. Erosion is the loss of tooth substances from areas not subject to attrition.

T F 2. Erosion usually occurs on the occlusal two-thirds of the tooth.

T F 3. The enamel and dentin at the base of an erosion lesion are soft and highly susceptible to decay.

T F 4. Patients who suck highly acid fruit, such as lemons, may develop acid erosion on the facial surfaces of their incisors.

T F 5. The exact cause of idiopathic erosion is tooth decay.

T F 6. Relief of pain caused by erosion can be achieved through topical applications of sodium fluoride paste.

235. Define resorption, and differentiate between normal and pathologic resorption.

Resorption. Although there are many varieties of resorption involving different body structures, this discussion is concerned only with resorption of the teeth roots. Resorption is a process of dissolution of tissue by body fluids or cellular activity. Those cells which are active in the resorption of bone and dentin are called *osteoclasts*. Resorption and decalcification through osteoclastic action and rebuilding through osteoblastic action with subsequent calcification are continuous processes in all bones of the body. In tooth structure, however, after resorption has taken place, there is no natural repair.

Some resorption processes may be normal. Such an event occurs when the roots of the deciduous teeth are resorbed in order that their crowns may be shed to make room for the permanent teeth. Pathologic resorption sometimes occurs on the roots of permanent teeth. It results from trauma; from orthodontic appliances used to move teeth if the movement of the teeth is too rapid; from the attempted eruption of retained or impeded teeth; or from improperly designed prosthetic appliances. Infection, with or without cystic formation, may cause resorption of the teeth roots and of their surrounding structures.

Exercises (235):

1. What is resorption?

2. Give an example of normal resorption.

3. What processes could cause pathologic resorption?

124

116

Dental Therapeutics

IN THE FIELD of dentistry, several drugs are used in caring for the dental patient. While you do not prescribe drugs, you may be called upon to prepare medications and to aid the dental officer in administering drugs. In either instance, knowledge of drugs enables you to perform your duties with desired expertise and self-confidence. Further, having knowledge of drugs and drug actions helps you render aid to the dental patient during emergency situations—not to mention being able to protect yourself, your family, and friends against drug abuse.

Properly used drugs can aid in rendering a diagnosis, in treating or preventing a disease or other abnormal condition, in relieving pain or suffering, and in controlling or improving any physiological or pathological condition. Improper application of drugs has been known to cause physical and mental impairment and even death. Therefore, it behooves us to recognize our personal limitations in regard to drugs and to make rational application accordingly. In the interest of human life, experimenting with drugs should be left to the scientists in drug research laboratories, where experiments are carried out under highly controlled conditions. In this chapter, we begin with the methods of drug administration. Next, we discuss the actions of drugs, and finally we discuss specific categories of therapeutic agents and aids.

3-1. Drug Administration

Your job as a dental specialist requires you to assist the professional dental officer in all phases of patient treatment procedures. One phase of patient treatment involves the administration of drugs. In this phase, the dentist prescribes the specific drug and the dosage of the drug, but you are normally required to prepare the drug for administration.

236. Name and give specific facts about the common methods of drug administration, and given definitions of oral dosage forms, associate each with the form to which it relates.

Common Methods of Drug Administration. There are several common methods of administering drugs. Those commonly encountered in the dental clinic are listed below:

- Topical.
- Oral.
- Inhalation.
- Injection.

Topical. The topical method of administering a drug refers to applying the drug to the surface of the skin or mucous membrane to produce a local effect. Such drugs are in the form of ointment, lotion, or cream. A good example is the topical anesthetic ointment.

Oral. Oral administration of a drug is probably the simplest and easiest method. It is painless, requires no special apparatus, and produces a systemic effect in a short period of time. Drugs for oral administration may be prepared either in solid or liquid form. The solid forms are pills, tablets, troches, lozenges, and capsules. Although these terms are sometimes used interchangeably, there are differences in their meanings.

a. A *pill* is a small, globular, or oval dosage term used for medicinal purposes.

b. A *tablet* is a compressed or molded solid dosage, which may be coated or uncoated.

c. Troches and lozenges are molded, uncoated tablets, which are usually mixed with flavoring agents. They are dissolved in the mouth for their emollient (soothing) effect. They come in various sizes and shapes.

d. Capsules are solid dosage forms enclosed in either a hard or soft soluble container of a suitable form of gelatin.

The liquid forms used for oral drug administration are solutions, elixirs, and syrups. A *solution* uses water as a vehicle (carrying agent) for a drug. An *elixir* is a clear, sweetened liquid usually containing water and alcohol. A *syrup* is an aqueous solution of sugar that is used as a vehicle for a drug.

Inhalation. Drugs administered by inhalation are relatively few in number. Included in the highly volatile (easily vaporized) group are ether, nitrous

125

oxide, and oxygen. An inhalant often used in the dental clinic to revive patients experiencing syncope is aromatic ammonia inhalant. Some inhalants are supplied in cylinders equipped with regulators that are used to adjust the flow of the drug and with a face mask that aids in the administration. These inhalants are, of course, in gas form. Other inhalants, such as aromatic ammonia, are supplied in liquid form in a cloth-covered vial that can easily be crushed to release the liquid vapors.

Injection. Drugs to be injected are usually prepared with normal saline as the vehicle. However, some drugs that are rapidly absorbed and excreted by the body, such as penicillin, may be suspended in medicinal oils. To say that drugs are administered by injection is not very descriptive, since there are many methods of injecting drugs. The injection methods used in the dental clinic are the intramuscular and intravenous methods. Obviously, to inject a drug intramuscularly means to inject into a muscle; and to inject intravenously means to inject into a vein.

When the intramuscular injection method is used, the onset of the drug's action is slow, and the duration of the action is prolonged. This longer activity occurs since a pool of the medicament is deposited in the muscle, by injection, and the medicament is slowly absorbed into the tissues. The use of oils as a vehicle, or the addition of a vasoconstrictor may delay absorption and further prolong the drug's action. Care should be taken to prevent injection into any of the small blood vessels located in the muscle. After the needle has been inserted into the muscle, the syringe should be aspirated by pulling its plunger slightly back. If the needle has been inserted into a blood vessel, there will be blood visible in the barrel of the syringe. If this occurs, the syringe and its needle should be removed and reinserted into the muscle in another location. Injecting the medicament into the blood vessel will result in a more rapid absorption of the drug than is desired for intramuscular injections. This, of course, could be dangerous to the patient, since the planned dosage was intended for slow absorption. The more rapid absorption may place too much of the drug into the patient's system at one time.

Intravenous injections produce a very rapid response, since the drug is instantly carried to the tissue upon which it is to act. This injection method is used when a quick response to the drug is desired, as in emergency situations. Intravenous injections generally should be made slowly. Normally, the dental officer administers any injections (both intramuscular and intravenous) that are given in the dental clinic, and your job is concerned with preparing the drug for administration. This, however, does not rule out emergency situations where you may be called upon to give the injection while the dentist is performing closed-chest cardiac massage or other lifesaving procedures.

Choice of the Administration Method. The choice of drug administration is determined by the dentist. The method he selects for the administration of a drug depends on several factors. Basically these factors are:

- The effect desired.
- The rapidity of action needed.
- The nature and amount of the drug to be given.
- The physical condition of the patient.

Exercises (236):

1. Name the four common methods of drug administration.

2. What method of drug administration is used with ointments, lotions, or creams to provide a local drug effect?

3. Why is oral administration of a drug the simplest and easiest method?

Complete items 4 through 10 by matching the descriptive statement in column B to the appropriate oral dosage form in column A.

	Column A	*Column B*
____	4. Capsule.	a. A small globular or oval dosage.
____	5. Elixir.	b. Liquid dosage that uses water as a vehicle.
____	6. Solution.	c. Molded, uncoated tablets usually mixed with a flavoring agent. They are dissolved in the mouth for their emollient action.
____	7. Pill.	d. A clear, sweetened liquid usually containing water and alcohol.
____	8. Troches and lozenges.	e. An aqueous solution of sugar that is used as a vehicle for a drug.
____	9. Syrup.	f. A solid dosage form enclosed in either a hard or soft soluble gelatin container.
____	10. Tablet.	g. A compressed or molded solid dosage which may be coated or uncoated.

11. What type of drug administration method is used for highly volatile drugs?

12. What is usually used as the vehicle for drugs that are to be injected?

13. Why is the drug action slow and prolonged when the intramuscular injection method is employed?

14. What is accomplished by the addition of a vasoconstrictor or the use of oil as the vehicle in medicaments to be injected intramuscularly?

15. Why is it important not to inject into a blood vessel when giving an intramuscular injection?

16. What injection method is used when a quick response to a drug is desired?

17. What factors does the dentist consider when he is determining the method of drug administration?

3-2. Actions of Drugs

To understand how all drugs actually work inside humans is one of the challenges of modern medicine. It is true that we can easily explain the actions of certain drugs. For example, we know that magnesium sulfate causes water to be retained within the lumen of the bowel and that diarrhea results. But the reason for the actions of many other drugs remains obscure to us. Nevertheless, we can profit here from a discussion of the actions of drugs that we do understand. In this discussion, we will cover local and systemic drug actions.

237. Define local and systemic drug actions, and indicate the criteria that must be met by systemic medications.

Local Action. A local action is the effect that a drug or medication produces upon tissue at the point or area of application or introduction. Such effects, however, are confined to the site or area of application only if the medication is dispensed in reasonable doses. Included in medications with local action are emollients and demulcents. Emollients, which are fats or oils, are usually used as protective or softening agents for the skin. Demulcents are used to protect irritated or abraded tissue. Dusting powder, for instance, which is used on the hands before putting on rubber gloves, serves as a protective agent for the skin.

Systemic Action. This is the action of a drug on some tissue or organ remote from the site of introduction. Such action occurs only after the drug has been absorbed or after it has entered the vascular system. Before a drug is accepted for use as a systemic medication by the medical profession, it must first meet certain criteria. It must, for instance, be capable of the following:

a. Be administered so that it is introduced advantageously into the body.

b. Be absorbed. (This presupposes its solubility in one or more of the body fluids and its ability to permeate cell membranes.)

c. Reach specific cells of the body to modify an already existing function.

d. Be excreted by the body or destroyed within the body. (It may be eliminated unchanged or in combination with other waste products of the body, chiefly through the intestines, kidneys, lungs, or skin.)

Exercises (237):

1. What is local drug action?

2. What is systemic drug action?

Complete items 3 through 6 by indicating whether the descriptive statements concerning the desired capability for a systemic medication are true (T) or false (F).

T F 3. Systemic medications should produce an equal local and systemic effect.
T F 4. Systemic medications should be nonabsorbable in muscle tissues.
T F 5. Systemic medications should reach specific cells of the body to modify an already existing function.
T F 6. Systemic medications should be excreted or destroyed by the body.

238. Given a series of statements concerning the systemic action of drugs, indicate whether they are true or false.

Types of Systemic Drug Actions. The action of drugs cannot change the function of a cell, or cause any cell to produce a new response that does not already exist. Drugs can, however, alter the productivity of a normal or diseased cell, tissue, or organ through their stimulation, depression, irritation, or replacement effect. Drugs may also function to attenuate (weaken) or destroy microorganisms. Let's look a little closer at the stimulation, depression, irritation, and replacement actions of drugs.

Stimulation. The activity of a tissue or organ is increased by stimulation. Theophylline, aminophylline, and caffeine stimulate central nervous tissue. There are many other drugs that stimulate selected tissue within the body. However, it is significant to remember that overstimulation of cells actually results in depression.

Depression. This action of a drug decreases the power of the cell to function. A drug that decreases the ability of the respiratory center is called a respiratory center depressant. The barbiturates (phenobarbital, mepobarbital, and seconal) are central nervous system (CNS) depressants.

Irritation. This action produces slight temporary damage to tissue. Mild irritation usually results in stimulation of cells, but prolonged irratation causes depression of cellular activity. Marked irritation may initiate an inflammatory reaction and possible death of tissue. Castor oil is a mild irritant. A strong acid is a marked irritant.

Replacement. Replacement therapy is a term used to indicate the use of organs or gland secretions in the treatment of deficiency diseases in human beings. In general, it is a therapy of substitution. This type of therapy represents one of the greatest triumphs in modern medicine. For example, estrogens and androgens are a form of replacement therapy for nonavailable normal hormones, as are thyroid, insulin, etc.

Exercises (238):

Indicate whether the following statements concerning the systemic action of drugs are true (T) or false (F).

T F 1. Drugs function systematically to change the function of a cell or to produce a response that presently does not exist.

T F 2. Overstimulation of a cell actually results in depression.

T F 3. The action of a drug that decreases the power of a cell to function is called depression.

T F 4. Mild irritation usually results in depression of cells, but prolonged irritation causes stimulation of cellular activity.

T F 5. Replacement therapy is a term used to indicate the use of organ or gland secretions in the treatment of deficiency diseases in human beings.

239. State the methods that may be used to alleviate toxic reactions and identify the specific reactions that may result from drug administration.

Drug Toxicity. Any drug, medicinal preparation, or compound may have a toxic (poisonous) effect upon the human body. The undesirable effects of some drugs are trivial in the average person; but in others, these effects can be very serious and produce effects ranging from tissue damage to the death of the patient. Some of these undesirable effects appear early; others appear only after a prolonged administration of a drug. In some cases, the toxic reaction can be alleviated by adjusting the dosage; in other cases, the patient must be taken off the drug. In some severe cases, another drug must be administered to counteract the drug that is producing the toxic effect. Let's look at some of the undesirable effects that may be produced by drugs.

Side effects. This is an effect or action of a drug other than the one for which it is given or intended. The action of a drug may be therapeutic for one condition and become a side effect when it is used for a different purpose. Antihistamines, which are administered for their decongestant action, can also cause drowsiness. This drowsiness is a side effect of the drug.

Untoward effects. When a side effect is, or can be, harmful, it is known as an untoward effect. Morphine at times causes nausea, vomiting, and habituation. Prolonged administration of the antibiotic streptomycin causes destruction of the eighth cranial nerve. Aspirin may cause gastric upset or bleeding in the lining of the stomach. These are not the only drugs with untoward effects. Instead, there are literally hundreds of drugs that can have untoward effects if used improperly or without caution.

Antagonistic effects. When two or more drugs are administered to a patient and each drug has an opposite effect on an organ, the tissues, or the other drug, they are said to be antagonistic toward one another. Some drugs are highly valuable for their antagonistic effects. For example, a doctor may use sodium amytal (a barbiturate) to counteract poisoning by strychnine.

Synergistic effects. This is the "working together" effect, the enhancing effect one drug has on another. In the treatment of certain types of infections, the combined effects of penicillin and streptomycin are far greater than the effects afforded by either. Naturally, any combination of drugs is effective only when an organism is susceptible to their combined action.

Cumulative effects. Some drugs are excreted so slowly that one dose has not been completely eliminated by the body before the next dose is given. In this way, the drug accumulates in certain body tissues. Then, if administration is continued, it is possible for toxic effects to occur. Drugs such as mercury, iodides, and digitalis can have this cumulative effect.

Idiosyncrasy. This effect refers to an unexpected response to a drug, an effect that differs from that normally seen. For example, occasionally a patient becomes excited after an injection of morphine.

Tolerance. This is an acquired resistance to a drug in which the effective dosage level has to be progressively increased to attain the same result as that produced by the original dose. A drug addict, for instance, must keep increasing the amount of the narcotic he takes to obtain the same result that he obtained with the original dose.

Habituation. This is the psychological craving for the effect that a drug has on the body. Some people develop a habituation to almost anything. Aspirin, coffee, alcohol, amphetamines, and tranquilizers are common examples.

Addiction. This effect refers to a drug's ability to alter the physiological process within the body. The drug has become essential to the maintenance of ordinary cellular activity. Morphine is well known for its addicting ability.

Hypersensitivity. This is an unusual or exaggerated reaction of the body to a drug. Hypersensitivity in its most obvious and severe form is known as anaphylaxis. The precise reason for this occurrence is not fully understood.

Blood dyscrasias (abnormal blood conditions). Certain drugs have a direct effect upon blood; others have an indirect effect, by depressing the bone marrow, which decreases the production of red blood cells. Chloramphenicol is known to produce blood dyscrasias if it is improperly or inadequately administered.

Tetragenic effects. These are the effects drugs have on the unborn, causing fetal abnormalities.

Exercises (239):

1. What methods may be employed to alleviate toxic reactions to drugs?

Complete items 2 through 12 by matching the descriptive statements concerning toxic reactions in column B to the appropriate reaction listed in column A.

Column A

___ 2. Habituation.
___ 3. Tetragenic effects.
___ 4. Untoward effects.
___ 5. Tolerance.
___ 6. Blood dyscrasias.
___ 7. Side effects.
___ 8. Hypersensitivity.
___ 9. Idiosyncrasy.
___ 10. Addiction.
___ 11. Synergistic effects.
___ 12. Antagonistic effects.

Column B

a. An unexpected response to a drug that differs from that normally seen; for example, a patient's becoming excited after a morphine injection.
b. This effects means that the drug's side effects are, or can be, harmful.
c. When two or more drugs administered to a patient have opposite effects on an organ, tissue, or the the other drug.
d. The psychological craving for the effect that a drug has on the body.
e. This is the effect or action of a drug other than the one for which the drug was given or intended.
f. This is the "working together" effect, the enhancing effect one drug has on another.
g. This is the acquired resistance to a drug, in which the dosage must be increased to obtain the desired effect.
h. This occurs when a drug has become essential to the maintenance of ordinary cellular activity.
i. These are the effects drugs have on the unborn, causing fetal abnormalities.
j. This is an unusual or exaggerated reaction of the body to a drug.
k. Effects such as depressing the bone marrow.

3-3. Therapeutic Agents

Therapeutics is the science and art of healing. Therapeutic agents are those drugs that are used to treat diseases. These agents may be known by more than one name. They may be identified by a trade name (proprietary name) or by a generic name (nonproprietary name), or by both. In this section, we discuss these names and the major classifications of drugs. There are several ways to classify drugs. They can be classified according to their use, source, or chemical similarities. Sometimes they are not classified at all, just described therapeutically. For our purpose, we will classify them by their use. There are many sources available to help you find a particular drug. The Council on Dental Therapeutics of the American Dental Association annually publishes the book, *Accepted Dental Therapeutics (ADT),* formerly called *Accepted Dental Remedies (ADR).* The ADT is a compilation of drugs useful in dentistry. Drugs listed must have first met the criteria of the council. The ADT contains the description, dosage, pharmacological action, and therapeutic use of each drug. It is not the intent of this CDC to cover all the drugs listed in the ADT. Instead, we will cover only the major classifications of drugs and a few representative drugs of each class.

240. Given a series of statements concerning the names of drugs, indicate which are true and which are false.

Trade Names. Trade, or proprietary, names are given to drugs by the manufacturer of the drugs. These names distinguish the drugs produced by one manufacturer from like drugs produced by another manufacturer. For example, tetracycline, which is an antibiotic, is produced by various drug manufacturers under the names of Achromycin, Panmycin, Polycycline, Steclin, and Tetracyn. These drugs are the same—only their names are different. Manufacturers of drugs advertise their products by the trade name they have given the product in an attempt to influence dentists and physicians into prescribing that drug under its trade name. Once the drug has been prescribed under the trade name, a civilian pharmacist cannot legally substitute another like drug bearing a different trade name. In military pharmacies, however, the pharmacist may dispense the prescribed drug under a different trade name.

Generic Names. The official name of a drug is its generic name. For example, tetracycline is the official name for Achromycin, Panmycin, Polycycline, Steclin, and Tetracyn. The *United States Pharmacopeia* (U.S.P.) and the *National Formulary* (N.F.), which are the pharmaceutical standards made official by the Food, Drug, and Cosmetic Act, refer to all drugs by their generic name. Further, the Air Force encourages its dentists and physicians to prescribe drugs by their generic name.

Exercises (240):

Complete the following exercises by indicating whether the statements concerning drug names are true (T) or false (F).

T F 1. Trade names distinguish the drugs produced by one manufacturer from like drugs produced by another manufacturer.
T F 2. The official name for a drug is its trade name.
T F 3. Manufacturers usually advertise drugs by their generic name.
T F 4. If a drug has been prescribed by its trade name, any pharmacist may substitute a like drug bearing a different trade name.
T F 5. The official pharmaceutical standards refer to all drugs by their generic name.

241. Name the functions and groups of analgesics, and indicate the representative actions of specific analgesic drugs.

Analgesics. Analgesics are drugs that relieve pain without acting to depress consciousness. Some of the drugs used as analgesics have an added function: they also relieve or reduce fever. Normally, analgesics are divided into two groups for discussion purposes—narcotic and non-narcotic analgesics.

Narcotic analgesics. Analgesics are drugs that reduce pain. Some analgesics are narcotics, some are not. The narcotic analgesics are used to relieve severe pain. They do, however, produce side effects that preclude their continued use. *Morhpine sulfate* falls into this category. There is probably no drug superior to morphine for the relief of pain. It not only relieves pain but acts swiftly. However, morphine is habit-forming, depresses breathing, and contracts the pupils of the eyes. These adverse side conditions limit the use of morphine. *Codeine* is another narcotic analgesic that has much the same action as morphine. It does, however, have some distinct advantages over morphine. Codeine is less habit-forming; it depresses respiration less than morphine; and, when administered with other drugs, it increases their effectiveness. Still another narcotic analgesic is *meperidine* (Demerol). Meperidine is almost ideally suited for the relief of pain or for cough supression. Although, meperidine's side effects may include dizziness, sweating, nausea, and vomiting, such side effects are experienced less with meperidine than with codeine or morphine.

Non-narcotic analgesics. Non-narcotic analgesics produce a loss of pain without the loss of consciousness that may be produced by narcotic analgesics. In addition to their pain-reducing (analgesic) action, most of the drugs in this group also function as an antipyretic (fever-reducing agent). These agents are most effective when used for pain that is not of the deep-seated type. Deep-seated pain usually requires administration of a narcotic analgesic, but for most dental pain, narcotic analgesics are not really necessary and should be avoided. Salicylates are the most representative members of the non-narcotic analgesic group. They relieve pain and reduce abnormally high body temperature in febrile (feverish) patients. As an analgesic, aspirin is most popular and effective against pain that is not of a deep-seated origin. Aspirin is also combined with other agents, such as caffeine and phenacetin, and in some cases amphetamines, to relieve pain and produce a feeling of well-being. Frequent, large doses of aspirin are likely to produce a condition known as salicylism. This condition is characterized by ringing in the ears, mental confusion, and profuse sweating. Idiosyncrasies to aspirin are quite common and usually occur in the form of urticaria (raised patches and itching of the skin); edema (swelling); bleeding of the stomach lining; and often anaphylactoid-like (hypersensitive) reactions. As with other drugs, care must be taken when dispensing aspirin. Ulcer patients, in particular, should not be administered aspirin.

Acetaminophen (Tempra, Tylenol) is a synthetic agent. In the treatment of musculoskeletal conditions, acetaminophen relaxes the skeletal muscles better than the salicylates and is less toxic an analgesic. It is useful where patients are allergic to aspirin.

Propoxyphene hydrochloride (Darvon) is a synthetic, non-narcotic drug. It is usually combined with other analgesics, such as aspirin, to provide relief from mild to moderate pain. Like the narcotic analgesics, it does not reduce fever when used by itself.

Exercises (241):

1. What is the function of analgesics?

2. Which group of analgesics is used to relieve severe pain?

3. What drug is probably most superior for the relief of pain?

4. What adverse side conditions limit the use of morphine?

5. How does codeine compare to morphine in regard to its addictive powers?

6. Which narcotic analgesic is almost ideally suited for the relief of pain or cough suppression?

7. Which group of analgesics are most effective for pain that is not of a deep-seated origin?

8. What group of drugs is most representative of the non-narcotic analgesic group?

9. In addition to relieving pain, what other beneficial effect is provided by salicylates?

10. What condition is likely to be produced by frequent large doses of aspirin?

11. For what type of patients is the use of aspirin contraindicated?

12. When would acetaminophen be the drug of choice over aspirin?

13. Which non-narcotic analgesic does not have an antipyretic effect?

242. Identify the drug action, use, and classification of specific sedatives and hypnotics.

Sedatives and Hypnotics. Often in the treatment of various disorders and diseases, it becomes necessary to relax the patient or produce sleep. Agents that are employed for this purpose are termed "sedatives" and "hypnotics." Sedatives allay excitement and activity but do not produce sleep. Hypnotics, also called soporifics or somnifacients, are drugs that produce sleep. With few exceptions, a drug that produces sedation in small therapeutic doses acts as a hypnotic in larger therapeutic doses. Similarly, a hypnotic drug functions as a sedative in smaller therapeutic doses.

The barbiturates are the most commonly used sedative and hypnotic drugs. These agents produce all levels of central nervous system depression, from mild sedation to coma. As we briefly discuss the barbiturates, you should be familiar with some terms that compare the actions of the various agents. These terms refer to the onset and length of action of the drug. Barbiturates are classified rather arbitrarily by the duration of their clinical effects into "ultrashort," "short," "intermediate," and "long" acting compounds. The speed of onset of their therapeutic effects generally parallels their duration of action. For example, a long-acting drug, such as phenobarbital, may require 30 to 60 minutes for induction following the oral administration of a sleep-producing dose. The sleep may last 4 to 6 hours longer and leave a moderate "drug hangover." Those drugs of short duration, such as pentobarbital, usually produce their effects in from 15 to 30 minutes and cause a sleep of from 2 to 4 hours, often without any "drug hangover."

Side effects of the barbiturates include skin eruptions, photosensitivity, muscle and joint pain, vertigo, headache, nausea, and vomiting. Intravenous administration of the barbiturates may lead to shock and severe respiratory depression, especially if the injection is too rapid. Many drugs, such as alcohol, tranquilizers, antihistamines, and narcotic analgesics, will increase the action of barbiturates and could seriously endanger or claim the life of the patient. Therefore, no barbiturate should ever be given in normal dosage in conjunction with these drugs.

Exercises (242):

Complete the following exercises regarding drug action, sedatives, or hypnotics by writing the appropriate missing words in the blanks provided.

1. Sedatives and hypnotics are agents employed in cases where it becomes necessary to ______ ____________________ the patient or to ______________ sleep.
2. Drugs used as agents to produce sleep are called ______________ (also soporifics or somnifacients).
3. Drugs used as agents to allay excitement and activity (but not to produce sleep) are known as ______________ .
4. An increased dosage of a sedative drug might cause it to act as a ______________ .
5. The most commonly used sedative and hypnotic drugs are the ______________ .
6. Barbiturates produce all levels of central nervous system depression from ______________ to ______________ .
7. Barbiturates are classified by the ______ ______________ of their clinical effects.
8. The ____________________________ of ______________ of the therapeutic effect of barbiturates generally parallels their duration of action.
9. Intravenous administration of barbiturates may lead to __________________and severe ______________ , especially if the injection is too rapid.
10. Many drugs, such as ______________ , ______________ , ______________ , and ______________ ______________ will increase the action of barbiturates and could seriously endanger the life of the patient.

243. Given a series of statements concerning the functions, characteristics, use, and untoward effects of antibiotics, determine which are true and which are false.

Antibiotics. Antibiotics are substances produced from or by various bacteria and fungi. Antibiotics suppress the growth of other organisms (attenuation) and in some instances destroy them. There are literally hundreds of antibiotics, but some are too toxic for use on humans. Some effects are not beneficial to man. Each has its own possible side or untoward effect and can, in certain circumstances, cause a disturbance in the normal physiological functions within the body. To be an ideal antibiotic, a substance should:

a. Exhibit selective and effective antimicrobial activity, preferably against several microorganisms.
b. Have little or no side or untoward effect.
c. Not disturb any vital organ or its function.
d. Not have its effect reduced by the body's fluid, plasma, protein, or enzymes.
e. Be water soluble and stable.
f. Be manufactured at a reasonable cost to the patient.

Penicillin and its semisynthetic derivatives are still the most important of the available antibiotics. It is by far the most common drug of choice for dental infections. Dramatic results have been obtained from its use, even within its narrow spectrum. On a weight basis, penicillin G is one of the most potent antibiotic agents in use today. Some bacteria have become resistant to almost all forms of penicillin; yet, others have remained just as sensitive to penicillin as with their first exposure. For example, *Treponema pallidum* (syphilis spirochete) is one of the most sensitive organisms to penicillin G. The pneumococci is another organism that is very susceptible to penicillin. Organisms that are sensitive to penicillin are not only inhibited from further growth, but in some cases are actually killed in adequate concentration of the penicillins. It has been proved that bactericidal (killing) action is a relatively slow but continuous process. Increasing the dosage or concentration of penicillin does not accelerate its bactericidal effect. One essential requirement for the bactericidal action of penicillin is that the bacteria be actively multiplying. Penicillin causes a lysis (decomposition) of the bacterium's cell wall and interferes with its assimilation of necessary elements to build a new cell wall.

The penicillins are no exception to the rule that any drug can provoke a variety of side and untoward effects. Hypersensitivity is the most common reaction to penicillin. Other reactions include pain, sterile inflammatory reactions, and phlebitis (inflammation of the vein) at the site of the injection. Injections of penicillin G into a blood vessel can prove fatal to a patient because penicillin G is insoluble and, consequently, is transported to the lungs where it acts as a pulmonary obstruction. If the obstruction becomes extensive enough, death results. When a person is known to be allergic to penicillin, erythromycin is normally the drug used as a substitute.

When it was observed that certain pathogenic organisms were developing resistance to the penicillins, a systematic search was started for an antibiotic that would be effective against the resistant organisms. This search led to the development of streptomycin. In high concentrations, streptomycin is bactericidal; whereas, in low concentrations, it is bacteriostatic. Bactericidal agents destroy bacteria, and bacteriostatic agents inhibit the growth and multiplication of bacteria. Some of the organisms that were originally sensitive to streptomycin are now partially or totally resistant to its effect. Streptomycin is poorly absorbed in the gastrointestinal tract, and when it is given orally, it is almost totally eliminated unchanged in the feces. Consequently, intravenous or intramuscular injections are the preferred routes.

Streptomycin, too, is no exception to the rule that all drugs are potentially harmful to man. It has produced a wide variety of side and untoward effects in man. The most important toxic effect of streptomycin is that involving part of the central nervous system, particularly the eighth cranial nerve. Deafness has developed in many individuals when the drug has been administered for more than 1 week. Blurred vision was noted in a few instances when the drug was continued for over 25 days.

Tetracyclines are like penicillin and streptomycin in their side and untoward effects. They, too, are potentially harmful to man. Burning of the eyes, black coating of the tongue, hypersensitivity, nausea, vomiting, diarrhea, blood dyscrasia, and superinfections are a few of the possible complications that have resulted from the use of tetracyclines. Their use is contraindicated during periods of tooth development, because they may produce disfiguring stains on teeth.

You may hear chloramphenicol called chloromycetin. Chloramphenicol has a fairly broad spectrum effect and is mainly bacteriostatic in the normal dose range. The theory of the action of chloramphenicol on bacteria is that it inhibits protein synthesis. In effect, we can say that the bacteria starve to death.

Exercises (243):

T F 1. Antibiotics are substances produced from various bacteria or fungi.
T F 2. Antibiotic suppress the growth of other organisms and in some instances destroy them.
3. To be an ideal antibiotic, a substance should:
T F a. Exhibit selective and effective antimicrobial activity.
T F b. Predictably disturb the function of a vital organ.
T F c. Be manufactured at a reasonable cost to the patient.
T F d. Have its effect reduced by the body's fluid, plasma, protein, or enzymes.
T F e. Be water insoluble and unstable.
T F f. Have little or no side or untoward effect.
T F 4. In most instances, streptomycin is the drug of choice for dental infections.
T F 5. Tetracyclines are contraindicated during periods of tooth development, because they may produce disfiguring stains on the teeth.
T F 6. The theory of the action of chloramphenicol on bacteria is that it invades the cell walls and destroys the nucleus.
T F 7. Oral administration of streptomycin is preferred, since this antibiotic is highly soluble in gastric juices.
T F 8. Increasing the dosage or concentration of penicillin accelerates its bactericidal effect.
T F 9. One essential requirement for the bactericidal action of penicillin is that the bacteria be actively multiplying.
T F 10. To produce the most desired effect, penicillin G should be injected into a blood vessel.
T F 11. Bacteriostatic agents destroy bacteria and bactericidal agents inhibit the growth and multiplication of bacteria.
T F 12. The most important toxic effect of streptomycin is that involving part of the central nervous system, particularly the eighth cranial nerve.
T F 13. Chloramphenicol has a fairly broad spectrum effect and is mainly bacteriostatic in the normal dose range.
T F 14. When a person is known to be allergic to penicillin, erythromycin is usually the drug of choice.

244. State the purpose and use of hemostatics, and name the types of hemostatic agents used in dentistry.

Hemostatics. When we think of hemostatics, what comes to mind? If we take the word apart and look at it, we arrive at hemo- (blood) and -static (not moving). So, it means the blood is not moving. In the case of a hemostatic agent, it would be something to stop the blood from moving. The most common dental problems with hemorrhage occur following a tooth extraction. When hemorrhaging occurs, the hemostatics commonly used are the absorbent type and the vitamin K therapy type.

Among the more common absorbable hemostatics are *gelatin sponge, U.S.P., oxidized cellulose, U.S.P.*, and *oxidized regenerated* cellulose. The gelatin sponge, U.S.P. (Gelfoam), is a pliable, surgical sponge material that absorbs and retains blood until it coagulates and forms a firm clot. Both the oxidized cellulose (Oxycel, Novocell) and the oxidized regenerated cellulose (Surgical) react chemically with the blood, which leads to rapid coagulation. The basic difference between the two products is in the method of their manufacture. All of these products are used in dentistry in about the same way. That is, they are used to pack sockets following tooth extractions and as a sutured implant in oral soft tissues. Absorbable gelatin sponge is normally absorbed in 4 to 6 weeks. Small amounts of the oxidized cellulose types are absorbed in 2 to 7 days, but large amounts may take up to 6 weeks before total absorption is complete.

Normally, vitamin K is derived from bacterial action upon certain ingredients in one's diet. However, when the diet is inadequate or when there is an imbalance of the required bacteria, a person's ability to produce vitamin K is impaired. Since vitamin K is necessary to help the human body in the blood coagulation process, it follows that supplements of vitamin K are sometimes necessary. Patients having a history of blood-deficient coagulation properties are sometimes given vitamin K before surgical operations.

Exercises (244):

1. For what purpose is a hemostatic agent commonly used in dentistry following a tooth extraction?

2. Name three of the more common absorbable hemostatics used in dentistry.

3. What is the basic difference between the two types of absorbable hemostatics that react chemically with the blood?

4. Summarize the two ways absorbable hemostatics are used in dentistry.

5. Under what condition might a dental patient be given a vitamin K therapy type of hemostatic prior to surgical operations?

245. Indicate the purpose, types, and administration techniques of dental anesthetics.

Local Anesthetics. Anesthetics are drugs that diminish or eliminate the sensation of pain. While analgesics are administered to relieve pain from an existing condition, anesthetics are administered to eliminate sensation to pain that might be produced by the operative or surgical treatment of a condition. Local anesthetics eliminate sensation by blocking pathways of pain impulses (the nerves).

Topical anesthetics. Topical anesthetics are usually applied with a cotton-tipped applicator or aerosol spray. When they are applied to the area, they produce only superficial anesthesia and are often used prior to injecting the local anesthetic. They also have other uses in dentistry, such as for application prior to scaling the teeth, for making impressions, or for radiographs.

Local infection anesthetics. Local injection anesthetics are used more by the dental profession than by any other profession. The intended result of using local anesthetics is to produce anesthesia in a specific area. There are many brands of local anesthetics available and most of them work in the same way. As a general rule, the dentist injects these anesthetics as close as possible to the area nerve fibers.

Two types of injection procedures used by the dentist are the regional block and regional infiltration. In regional block anesthesia, he injects the anesthetic solution around a nerve trunk between the area to be anesthetized and the brain. An example of this technique is the mandibular block. The dentist—using a 27-gauge, $1^3/_{16}$-inch, or 25-gauge, $1^7/_8$-inch (long) needle—deposits the anesthetic agent over the mandibular nerve trunk as it enters the mandibular canal. This injection blocks all the impulses of the mandibular nerve originating forward of the injection site. The effect does not cross the midline of the mouth.

The dentist gives regional-infiltration anesthesia when it is necessary to anesthetize only a small area of tissue and minimal number of teeth, or when a nerve block is not desirable. Regional-infiltration anesthesia enables the dentist to limit the area of numbness to a specific area or a specific tooth if he so desires. Maxillary teeth and tissues are usually anesthetized by regional-infiltration because of the extreme porosity of the maxilla. The dentist uses a 25-gauge, 1-inch or $1^3/_4$-inch (short), needle to inject just above the periosteum as close to the position of the apex of the tooth as possible. Ordinarily, two basic kinds of injectable anesthetics are used in the Air Force Dental Service—lidocaine hydrochloride (HCl) and mepivacaine hydrochloride (HCl).

Lidocaine HC1 is also referred to as xylocaine. It is available in two forms—ointment for topical use and liquid for injection purposes. The injectable form is available in 1.8 cc carpules (glass-type cartridge) containing a 2-percent solution of lidocaine HC1 and varying amounts of vasoconstrictor. Vasoconstrictors are discussed in detail later.

Mepivacaine hydrochloride (carbocaine) is available in carpules of 2-percent mepivacaine with the vasoconstrictor, or in 3-percent carpules with no vasoconstrictors. The 1.8 cc standard carpule is used for all Air Force injection anesthetics to fit the syringes designed for this purpose.

Exercises (245):

Indicate whether the statements regarding dental anesthetics are true or false by circling the T or F.

T F 1. Both analgesics and anesthetics are drugs that diminish or eliminate the sensation of pain.

T F 2. Topical anesthetics are often applied prior to injection of local anesthetics, prior to scaling the teeth, for making impressions, and for radiographs.

T F 3. Both basic kinds of injectable anesthetics, lidocaine hydrochloride and mepivacaine hydrochloride, are available in 1.8 cc carpules.

T F 4. Local injection anesthetics are widely used by the dental profession to produce anesthesia in a specified area, so they are therefore injected as closely as possible to that area's nerve fibers.

T F 5. A regional *block* anesthesia would be the type of injection procedure used by a dentist if he desired to limit the area of numbness to a specific maxillary tooth.

T F 6. Anesthetics are administered to relieve pain from an existing condition.

T F 7. The usual method of application of a topical anesthetic is by *injection* in an area adjacent to nerve fibers.

246. Define vasoconstrictors and tell when they are used in dentistry.

Vasoconstrictors. As their name implies, vasoconstrictors are drugs that constrict blood vessels. They are particularly effective for constricting the blood capillaries.

Epinephrine is the most widely used vasoconstrictor in dentistry. When it is applied to a local area, it acts as a hemostatic. Its action is similar to that of a ligature wire tied on a blood vessel. Epinephrine as a local vasoconstrictor is also used in dentistry to prolong the effect of local anesthetics and render the area less hemorrhagic. The vasoconstricting action decreases the blood supply in the injection area which, in turn, decreases the absorption rate of the anesthetic. Thus, the slower the anesthetic is absorbed, the longer its effect. The amount of vasoconstrictor is determined by the procedure to be accomplished and by the patient's requirement. Some operations require more time than others, and a prolonged effect is desirable. Levonordefrin is another vasoconstrictor that is commonly used in dental anesthetic solutions.

Exercises (246):

1. Vasoconstrictors are drugs that ________________ blood vessels and are particularly effective for constricting the blood ________________ .
2. The vasoconstrictor most widely used in dentistry is ________________ , and when applied to a local area, it acts as a ________________ .
3. The slower the local anesthetic used with epinephrine is absorbed, the ________________ is its effect; so, the amount of vasoconstrictor used is determined by the desired prolonged effect.

247. Identify the action and use of antisialagogues in dentistry.

Antisialagogues. Antisialagogues are drugs which reduce the flow of saliva. These drugs are sometimes used on patients who secrete an excessive amount of saliva. This enables the dentist to complete dental operations without the problem of moisture contamination from saliva. Antisialagogues are used only on patients having severe salivary problems, since in addition to making the mouth dry, they cause dryness of the throat and make speaking difficult. Atropine sulfate and scopolamine are representative of the antisialagogues used in dentistry.

Exercises (247):

1. What drugs are useful in dentistry to reduce excessive amounts of saliva secreted by patients?

2. Give two reasons why antisialagogues are used only on dental patients having severe salivary problems.

3. Name two representative antisialagogues used in dentistry.

248. Determine whether statements concerning the actions and uses of antiseptics and germicides are true or false.

Antiseptics and Germicides. Antiseptics and germicides have two broad uses in dentistry. The first is for the disinfection of instruments that do not come in contact with blood. The other is for topical application to the oral mucosa to prevent or control minor infections. Antiseptics stop or inhibit the growth of micro-organisms without necessarily destroying them. They are applied to the mouth by spray bottles, syringes, etc., to help clean an infected area or to clean the mouth as a whole. They can also be placed in cavities, in sockets, and under gingival tissue flaps.

The ideal antiseptic is one that does little damage to the skin and has the most harmful effect possible on bacteria. Chemical action is the primary means by which an antiseptic prevents the growth of bacteria. Typical antiseptics are alcohol, tincture of iodine, and preparations containing mercury.

Germicides are substances that destroy micro-organisms. They are used to swab the mucous membrane prior to injection and to treat inflamed areas. The difference between antiseptics and germicides is difficult to delineate. Many antiseptics in strong solution become germicides, and when germicides are diluted, they act as antiseptics.

Exercises (248):

Indicate whether the statements below concerning the actions and uses of antiseptics and germicides in dentistry are true or false by circling the T or F.

T F 1. Antiseptics are used solely for the disinfection of instruments, while germicides are used exclusively for topical application.

T F 2. Germicides stop or inhibit the growth of micro-organisms without necessarily destroying them, but must be in strong solution before they act as antiseptics.

T F 3. The ideal antiseptic does little damage to the skin, and yet has the most harmful effect possible on bacteria.

T F 4. Alcohol, tincture of iodine, and preparations containing mercury are typical antiseptics whose chamical actions prevent growth of bacteria.

T F 5. An agent that destroys pathogenic micro-organisms is defined as a germicide, but when diluted acts as an antiseptic.

249. Identify the action and use of antihistamines.

Antihistamines. Antihistamines are used to combat the body's allergic reaction to certain agents, such as pollens and drugs. Medically, antihistamines may be prescribed to counteract conditions such as hives, seasonal hay fever, and drug reactions.

In dentistry, they are generally used to counteract the body's allergic reaction to a drug that has been used during dental treatment. For example, a patient having a mild reaction to a local anesthetic would probably be administered an antihistamine drug.

Benadryl is the most frequently used antihistamine for such allergic reactions. In addition to Benadryl, the antihistamines with brand names "Chlor-Trimeton" and "Pyribenzamine" are representative of the group. Antihistamines may produce side effects of sleep, drowsiness, dizziness, and disturbance of body coordination.

Exercises (249):

Write one word in each space that follows to identify the action and use of antihistamines.

1. Antihistamines are used to combat the body's ____________________ reaction to certain agents, such as pollens and drugs.

2. In dentistry, a patient having a mild reaction to a local anesthetic would most frequently be administered the antihistamine ____________________, although "Chlor-Trimeton" and "Pyribenzamine" are also frequently used.

3. Antihistamines may produce ____________________ effects of sleep, drowsiness, dizziness, and disturbance of body coordination.

250. State the purpose, guideline, and dosage limits of the Air Force fluoridation program, and indicate the methods of administering fluoride compounds.

Fluoride Compounds. More than 50 million people drink water that contains controlled amounts of fluoride. Research has shown that when fluoride dosages are applied in the controlled amount of about 1.0 part per million (ppm) to the water supply, caries in children is greatly reduced. Currently, water is the most effective and economical means through which trace quantities of fluoride can be made available.

The condition called fluorosis (mottled enamel) is caused by excessive amounts of fluoride in the

124

water supply. Fluorosis can be prevented, of course, by reducing the amount of fluoride parts per million parts of water. Any fluoride removal program should not reduce the fluoride content below established standards.

The USAF Surgeon General prescribes the fluoride residual in the distribution for each installation. Because of the greater average intake of water in warm climates, the prescribed fluoride is maintained at a lower level than in cool climates. To determine the dosage that gives the desired residual, the natural fluoride content of the raw water must be considered. The desired spread is from 0.6 to 1.7 ppm of fluoride in the finished water supply with the optimum about 1.0 ppm. The specific regulation that covers the US Air Force policy on fluoridation and defluoridation of base water supplies is AFR 161-9, *Fluoridation and Defluoridation of Water Supplies.*

In areas where it it not feasible to add fluoride to drinking water, we can give dietary supplements of fluoride tablets. Administration of fluoride by either the drinking water or tablet route is called systemic fluoridation, meaning that its action is in the body systems. Another method of using fluoride is the topical application.

The topical method of applying fluoride is helpful to the teeth after they have erupted. This method employs stannous fluoride in a 10-percent aqueous solution. Application of this solution to all exposed areas of the teeth tends to make them decay resistant. The solution is to contact the teeth for 30 seconds, and the application is to be repeated at 6- to 12-month intervals. Other variations of applying fluoride topically are used, but the above described method is the only topical application method current approved by the Air Force.

Exercises (250):

1. Through what means are fluoride compounds in trace quantities currently made available for 50 million people so that caries in children is greatly reduced?

2. What condition results from excessive amounts of fluoride in the water supply?

3. Why is the prescribed concentration of fluoride in the water supply of southern bases lower than that of northern bases?

4. In terms of parts per million, what is the desired spread of fluoride concentration in base water supply systems?

5. What is the alternative method of administering fluoride in those areas where it is not feasible to add fluoride to drinking water?

6. Summarize the method of application currently approved by the Air Force to apply fluoride to the teeth after their eruption.

7. What regulation specifically covers the Air Force policy on fluoridation and defluoridation?

251. Identify the uses of oxidizing agents in dentistry.

Oxidizing Agents. Oxidizing agents are used in dentistry to bleach teeth and to treat certain gingival diseases. The oxidizing agent used to bleach teeth is a 30-percent solution of hydrogen peroxide (Superoxol). The bleaching is usually done in conjunction with root canal therapy. The oxidizing agent used to treat inflamed soft tissues is normally a 3-percent solution of hydrogen peroxide. The benefit derived is from the resultant cleansing rather than the oxidizing action, however. To be more specific, the bubbling action tends to loosen debris, so that it can be rinsed away to leave clean tissues.

Exercises (251):

Complete the following statements regarding the use of oxidizing agents in dentistry by writing the word of your choice in the blanks provided.

1. An oxidizing agent used in varying percent solutions to bleach teeth and treat gums is hydrogen ______________ .

2. A ______________ percent solution of Superoxol is used to bleach teeth.

3. Inflamed soft tissue is normally treated with a ______________ percent solution of hydrogen peroxide, but the benefit derived is from the resultant ______________ action.

252. Name the types and uses of solvents in dentistry.

Solvents. Solvents are substances that are used to dissolve other substances. In dentistry, solvents are used for cleaning purposes and for helping with

137

treatments. Common solvents used for cleaning purposes in dental clinics are orange oil, U.S.P.; alcohol, U.S.P. (ethyl alcohol); and isopropyl alcohol, N.F. The orange oil is very effective in dissolving zinc oxide and eugenol materials from the hands and face. Alcohols are effective in dissolving a variety of substances found on instruments, cabinet tops, etc. Alcohols, of course, are also used as disinfectants.

Chloroform and eucalyptol are solvents sometimes used to aid in treating root canals. Both substances are effective in partially dissolving and softening gutta-percha points before they are inserted as root canal-filling materials. Chloroform containing dissolved gutta-percha is called chloropercha, and eucalyptol containing dissolved gutta-percha becomes eucapercha.

Exercises (252):

1. For what two general purposes are solvents used in dentistry?

2. Name three common solvents used for cleaning purposes in dental clinics.

3. Name two solvents suitable for partially dissolving and softening gutta-percha points before their insertion as root canal-filling materials.

253. Indicate the uses of phenolic compounds in dentistry and specify what precautions should be taken when using phenol.

Phenolic Compounds. Phenolic compounds are used in dentistry for their antiseptic and disinfecting qualities. Camphorated paramonochlorophenol is the most commonly used phenolic compound. It is used during endodontic procedures to sterilize root canals. Also representative of this group are creosote and thymol. Creosote is also used to sterilize root canals in endodontic procedures. Thymol is sometimes mixed with camphor and used as a desensitizing paste. It is further mixed with zinc oxide and used as a pulp-capping material. Phenol (carbolic acid), itself, is a very caustic material. When it is used in any strength, you should have a 50-percent solution of alcohol available to neutralize it in case an accident occurs, since misplaced or spilled phenol could cause severe acid burns to soft tissues.

Exercises (253):

Indicate the uses of the phenolic compounds listed in items 1 through 3 by writing their use or uses in the spaces provided.

1. Thymol:
   a.
   b.

2. Creosote:

3. Camphorated paramonochlorophenol:

4. What should you have available as a neutralizer when you are using phenol?

3-4. Therapeutic Aids

Throughout the fields of medicine and dentistry, substances are used as aids in the art and science of treating patients. Such substances have little or no medicinal value but simply aid in rendering treatment. This section deals with a few of these therapeutic aids: dentifrices, mouthwashes, and selected physical aids.

254. Given a series of statements concerning the types and the therapeutic value of dentifrices and mouthwashes, determine which are true and which are false.

Dentifrices. Dentifrices are mostly therapeutic aids used in conjunction with a toothbrush to clean the dentition. Dentifrices are available in the form of powder, paste, and semiliquid. Most dentifrices consist of abrasives, flavoring, detergents, and a base vehicle (such as glycerin). Some dentifrices have had fluoride compounds added with clinically proven benefits realized. Tests have shown that some (not all) fluoride toothpastes used on a regular basis actually aid in reducing the incidence of tooth decay.

While some dentifrices aid in cleaning the teeth, some produce undesirable results. These undesirable results are directly related to the abrasive quality of the dentifrice in most cases. For example, the abrasiveness of some available dentifrices is so high that they scratch tooth enamel and erode the dentin rather severely. Although most people desire white and clean teeth, maintaining them by using highly abrasive toothpastes is unwise.

It is not possible to name a single dentifrice that is suitable for all patients, but recommendations should be based on individual cases. Because of its cleansing ability and reltively low abrasiveness, common baking soda is sometimes recommended for regular use. Also, two brand name dentifrices, Senosodyne and Thermodent, are recommended for patients with hypersensitive teeth. The dental officer usually prescribes usage of the sensitivity type dentifrices for limited periods of time. Thus, dentifrices should be carefully selected to meet the particular needs of each patient.

Mouthwash. In spite of claims of medicinal value, most mouthwashes are little more than a pleasant tasting rinse. Claims of "bacterial killing power" and "breath sweetener" qualities have been largely refuted in the laboratory. Mouthwashes fitting this description are of value, however, because they add to the patient's feeling of having received the full treatment. Thus, due to this psychological benefit (if for no other reason), such mouthwashes are likely to remain a part of dental treatment routines. Some other mouthwashes, such as the oxidizing agents discussed earlier, provide limited therapeutic benefit.

Exercises (254):

In the following exercises, circle the T or F to indicate whether the statements concerning dentifrices and mouthwashes are true or false.

T F 1. Most dentifrices consist of a base vehicle, abrasives, detergents, and flavoring.

T F 2. *Not* all fluoride toothpastes aid in reducing the incidence of tooth decay.

T F 3. Since highly abrasive dentifrices produce white and clean teeth, they are to be recommended because they produce desirable results.

T F 4. Common baking soda is *never* a recommended dentifrice, because its cleansing ability is low and its abrasiveness is high.

T F 5. Laboratory tests conclusively prove that mouthwashes "kill bacteria" and "sweeten the breath."

255. Specify the types, use, and value of the physical therapeutic aids.

Physical Aids. Under the heading of physical aids, we add a few of the other items that aid in the treatment of dental patients. Again, we are not attempting to include all physical aids in this discussion. Instead, the items that follow were selected because of their tendency to be misunderstood and because of their relative importance. We begin with toothbrushes, then follow with dental flosses, disclosing agents, water irrigating devices, and interdental stimulators.

Toothbrushes. Toothbrushes fall into one of two categories—manual or mechanical. That is, they are either the type used solely by hand or the type powered by a small electric motor. There have been many arguments presented as to which category is better. Suffice it to say that the toothbrush to be recommended for dental patients depends upon the merits of individual cases. The type of toothbrush frequently recommended has bristles that are of soft to medium rigidity. This recommended toothbrush also has a multiplicity of tufts equal in length to form a flat brushing surface. Overall, the entire head of the brush is from small to medium in size.

Should you be in a position to decide which toothbrush is best for a particular patient, be sure you have considered these points.

- Type of treatment patient is receiving (surgical, periodontal, etc.).
- Patient's present dental condition (normal, gingivitis, etc.).
- Relative size of patient's mouth.
- Patient's ability to manipulate a toothbrush.

Dental flosses. A general description of dental floss might read "a strong thin string or tape of nylon, which is sometimes waxed and is used to clean areas between the teeth." Quite often, the nylon, unwaxed type is the floss recommended.

Although dental floss is used to clean plaque from only a small portion of the total exposed tooth surfaces, these surfaces are important. In fact, the area cleaned by dental floss is more suspectible to decay and periodontal disease than other areas of the mouth. Stress the importance of using dental floss when you are counseling a patient on effective home care, but be sure to caution against snapping the floss between the teeth. Such action can injure gingival tissues.

Disclosing agents. Disclosing agents are dyes suitable for staining bacterial plaques found on the teeth. For effective cleansing of the entire mouth, it is important to know the areas where bacterial plaques are most likely to persist. The easiest way to do this is to stain the bacterial plaques so that they can be seen. Chewable tablets (called disclosing tablets or wafers) contain a dye and are suitable for this purpose. When chewed and swished between the teeth for about 30 seconds, the dye in disclosing agents stains any plaque on the teeth. The dye does not stain clean tooth surfaces or fillings, but it will stain the tongue and lips for up to 2 hours. Staining of the lips can be prevented by coating them lightly with a lubricant such as vaseline.

To assure complete cleansing of the teeth, they should be inspected in a mirror with a good light to see where the areas of plaque are located. A mouth mirror used in conjunction with a regular mirror makes it possible for the patient to see the inside surfaces of his teeth. Until one has thoroughly mastered the methods for plaque removal, the disclosing dye should be used again after brushing and flossing to check on the success of the cleaning.

Water-irrigating devices. Water-irrigating mechanisms or hydrodevices are useful in rinsing away dislodged or loose oral debris. Their intended use is primarily as an adjunct to normal mouth cleaning devices. Following normal brushing and flossing, these devices may be of value to some individuals. But irrigators are of particular value in helping to clean areas sheltered by orthodontic appliances, fracture and peridontal wiring, and splints. A variety of these mechanisms is available.

Interdental stimulators. Interdental stimulators are gingival massaging devices. There are two types available—rubber and wood. The rubber type is sometimes attached to the handle end of a toothbrush. The wood type is a thin triangular wedge. Interdental stimulators should be used with caution. The normal healthy adult obtains the necessary gingival massaging while brushing his teeth.

Exercises (255):

1. Although the type of toothbrush recommended depends upon the individual case, summarize a typical recommendation for an average patient.
2. Give briefly four points you should consider in deciding which toothbrush is best for a patient.
3. When briefing a patient concerning the use of dental floss, why should you caution him against snapping the floss between the teeth?
4. What two types of mirrors should a patient use to assure complete cleansing of bacterial plaques when he uses the disclosing agent (dye) method without technical assistance?
5. What type of physical aid would be of particular value in helping to clean areas sheltered by orthodontic appliances, etc.?
6. Are interdental stimulators recommended for all normal healthy adults? Why?

CHAPTER 4

Basic Microbiology and Sterilization

WE LIVE IN A world that is generously supplied with minute organisms referred to as micro-organisms. Since it has been established that these micro-organisms play definite roles in the health status of mankind, it is important that we consider some basics regarding them. As with many living things, we have generally divided micro-organisms into two groups—those we consider to be good for mankind and those we consider bad for mankind. In this study, we are primarily concerned with the "bad" (disease-producing or harmful) group, since it is definitely related to general health as well as dental health. From the dental health standpoint, you are directly involved because you have a major role to play in destroying these harmful micro-organisms found in the dental environment. This is especially true in your role of caring for dental instruments. In this chapter we consider, in order, basic microbiology, sharpening dental instruments, sterilization and disinfection of instruments, and finally storage of instruments.

4-1. Microbiology

Microbiology may be defined by looking at the root words from which it is formed: "micro"—"small", or in this instance, "too small to be seen by the naked eye"; "biology"—"the study of living things." Thus, the definition of microbiology is "the study of living organisms (micro-organisms) too small to be seen with the naked eye."

256. Identify micro-organisms by classification, structural makeup, characteristics, behavior, functions, and diseases they are associated with.

Throughout the world, there are many hundreds of micro-organisms. There are many ways to classify micro-organisms. We will divide our study into five areas: bacteria, viruses, rickettsiae, protozoa, and fungi. We have neither the time nor space to treat these organisms extensively. We will discuss the main points and differentiate between each area to give a general overview of each organism.

Bacteria. Bacteria are one-celled micro-organisms. Unlike the typical cell, a bacterial cell does not have an organized nucleus. The nucleus is diffused throughout the cell. Bacterial cells occur in a number of shapes: spherical, called *cocci;* rod-shaped, called *bacilli;* coil-shaped, called *spirochetes* or *spirilla.* The shape of a particular bacteria is one of the criteria used in its identification. Another factor in the identification of bacteria is the way the cells are arranged or grouped together. An arrangement grouped in clusters like grapes is called staphylococci. Some cocci arrange themselves into pairs. Paired organisms are called *diplo;* thus, the term "diplococci." Still another group of cocci form into long chains; these organisms are known as streptococci. The bacillus organisms, or rod-shaped bacteria, may align themselves into chains or pairs, and these may be called streptobacilli or diplobacilli—but these terms are not often used. The spirochetes will vary from a loose spiral to a tightly coiled spring. They may be short or very long. They always appear as individual cells and do not form clusters or chains.

The pairing, chaining, or clustering of bacterial cells is a result of the organism's method of reproduction. The cells multiply by a process called binary fission (fission is "to split"; binary means "two"); thus, the splitting of one organism into two organisms just like the parent cell. If fission is complete, the cells may be found individually or in clusters; but if the fission is incomplete, the cells may remain in pairs or in long chains. The polymorphic bacteria are just what the name implies, many shapes. They appear as nodular filaments, short, clumpy rods, or possibly even Y-shaped organisms.

In addition to different shapes and groupings, some bacteria have special structures that aid them in motility or survival in nature. All bacteria possess an outer coating known as a capsule. Some may have a capsule so thin that it is undetectable. Others have a very thick, sticky capsule composed of a complex sugar-fatty-protein substance. It is believed that this capsule aids in the organism's survival against the white blood cells in the body.

To enable them to move about, some of the bacilli have special structures called flagella. A flagellum is a hairlike appendage that whips back and forth and either pulls or pushes the organism about. Some cells have only a single flagellum, while others may have several or may even be completely covered with flagella. The sole purpose of the flagella is for movement.

Another special structure that develops in some of the bacteria is the spore. Any time certain organisms find themselves in an unfavorable environment, they concentrate their protoplasm into a little round ball and become extremely resistant to the unfavorable condition. When the spore is formed, you can clearly see the rigid cell wall with the little ball inside. This dormant form enables the organism to survive adverse conditions that normally destroy bacteria. One species, *Bacillus anthracis* (anthrax), has been known to live for as long as 40 years outside of the animal body. Some organisms can withstand boiling for as long as 2 hours.

One thing must be kept in mind here. In order for bacteria to cause disease, they must have the proper environment to survive. Bacteria have no mouth and absorb their food directly through their cell membranes. Their food or nutrients must be part of their environment, and there must be sufficient moisture to sustain life. Temperature is a very critical requirement for bacteria. Most bacteria (disease-producing) can survive only at body temperature. Therefore, when this temperature is lowered or elevated, they will cease to grow and sometimes die. Basically, we can say that a particular bacteria, in order to reproduce or grow, must have the proper temperature, nutritional requirements, and moisture (environment).

As the bacteria grow, they produce waste products and sometimes excrete other substances used in their digestion. These products may be toxic or poisonous to us, and we call them bacterial toxins. Exotoxins are toxins which diffuse out of the bacterial cell into the surrounding media. Endotoxins do not diffuse out normally but are liberated by autolysis or physical disintegration. In either case, these are the substances that make bacteria harmful. Can you see that bacteria in their simple one-celled form are actually very complex little organisms?

Another method of classifying bacteria is on the basis of their reaction to the gram stain. In this classification, bacteria are divided into two broad groups, the gram-positive and gram-negative. We will discuss this staining process and talk more about bacteria later in this chapter.

Viruses. Viruses are a group of ultramicroscopic, disease-causing agents. In the past few years, vast amounts of knowledge have been attained about these little "bugs," but they are still a mystery to people outside the field of virology. They are so different from the other disease-causing agents that they cannot be compared with any of them. They belong to neither the plant nor animal kingdom, and only a few can be seen without the aid of an electron microscope. They do not fit our present biological definition of "living" organisms. They do not die. They merely inactivate or disassociate themselves. They do not reproduce themselves but cause a living cell to replicate or reproduce them. They do, however, cause a wide variety of diseases in plants and animals. We, therefore, only mention them here and leave the study of viruses to the virologist. Examples of virus-caused diseases are smallpox, measles, poliomyelitis, yellow fever, and the common cold.

Rickettsiae. Rickettsiae are a group of organisms intermediate in many characteristics between the bacteria and viruses. Rickettsiae will not reproduce outside of a host cell. In other words, they require the presence of a living cell for growth. Rickettsiae are primarily parasites of insects and are transmitted to man by fleas, lice, mites, or ticks. The most common rickettsial diseases are Rocky Mountain spotted fever and typhus.

Protozoa. Protozoa is the lowest division of the micro-organisms of animal life, and is composed of one-celled organisms. There are many species of protozoa, but the majority are harmless to man. A protozoa differs from the "typical cell" in that it is a true member of the animal kingdom and does not have a cell wall. Its outer covering is the cell membrane, which is flexible like a plastic bag. It does possess all the other parts of a typical cell, including an organized nucleus, vacuoles, and cytoplasm. Some of these one-celled animals have parts not included in the typical cell. Some have flagella or cilia, which are organs of locomotion, and some have a cytostome, which is a kind of primitive mouth. These organisms are as different as day and night. There are four classes of protozoa, and we will only mention them here. You will note that the first two are the causes of diseases familiar to you:

(1) Sarcodina (amoeba), the type that causes amebic dysentery.
(2) Sporozoa, the type that causes malaria.
(3) Mastigophora (flagellates).
(4) Infusoria (ciliates).

Fungi. The fungi are small members of the plant kingdom commonly referred to as yeasts and molds. They have no roots, stems, or leaves, and possess no chlorophyll. Chlorophyll is the substance used by members of the plant kingdom to convert carbon dioxide, water, and sunlight into sugars. Therefore, the fungi, lacking chlorophyll, must depend upon some other source for their livelihood. This other "source" concerns us; it is the living organism. We normally refer to an infection caused by the fungi as a fungus infection. Most of the pathogenic fungi produce superficial infections and grow on the skin. The condition referred to as ringworm is an example of this type of infection. Other fungi are responsible for more serious infections, where the fungus invades the lungs and other tissues of the body.

Fungi do not look at all like typical cells. They are round, oval, or filamentous, and much larger than the bacteria cell. They have a large vacuole, taking up a good portion of the cell and usually a few large granules between the vacuole and cell wall. Identification is based almost entirely on the type of colony the fungi produce. Like bacteria, fungi are ever-present in our environment. Some are harmful to us, while others are beneficial. There are many industrial uses of fungi. Penicillium and several other fungi are used in the production of antibiotics. The undesirable fungi are pathogenic to plants and animals and are very difficult to control. Spores are found on everything. They blow around in the air and can grow on anything that hints at being a nutrient. Because of their prevalence in nature and their association with disease, they are of prime concern to the field of medicine.

Exercises (256):

1. Name the five categories of micro-organisms.

2. Name three factors that play a role in the identification of bacteria.

3. What names apply to the following shapes of bacteria?
   a. Spherical.

   b. Rod-shaped.

   c. Coil-shaped.

4. What name would apply to coccal bacteria that arrange themselves into pairs?

5. What name would apply to coccal bacteria that arrange themselves into long chains?

6. What is the process by which cells multiply called?

7. What is the outer coating of a bacteria called?

8. What is a flagellum?

9. When certain organisms find themselves in an unfavorable environment, they concentrate their protoplasm into a little round protective ball. What is an organism in this state called?

10. What must pathogenic bacteria have in order to cause disease?

11. What are viruses?

12. What micro-organisms are associated with diseases such as smallpox, measles, poliomyelitis, yellow fever, and the common cold?

13. By what means are rickettsiae usually transmitted to man?

14. Name the two most common rickettsial diseases.

15. What is the lowest division of the micro-organisms of animal life, composed of one-cell organisms?

16. Which group of micro-organisms is responsible for malaria and amebic dysentery?

17. Which group of micro-organisms is commonly referred to as yeasts and molds?

18. What types of conditions may be produced by pathogenic fungi?

19. Why must fungi depend on other living organisms for their livelihood?

4-2. Oral Flora

Although men had been familiar with some of the effects caused by bacteria for some time, it was in Holland in 1683, that Anton Van Leeuwenhoek (pronounced Loo-vahn-hoke) invented the first scientific microscope. He was an amateur lens grinder, cutting and polishing quartz. He ground some of the pieces in concave form and others in convex. When he looked through some of these lenses, objects looked larger than they really were. One day while looking through one of the magnifying glasses (he actually made a crude microscope) at some saliva from his mouth, Van Leeuwenhoek became the first person to see a micro-organism. He saw bacteria—or oral flora. Since oral flora are minute unicellular (one cell) plantlike organisms and since they are colorless, one may wonder how Van Leeuwenhoek could have seen them through his crude microscope. It is probable that he was chewing tobacco and the tobacco juice acted as a disclosing agent and stained the flora. At any rate, he was the first to see bacteria—and they were rod-shaped. Since the Latin word bacteria means rod shape, the scientists simply called these rod-shaped organisms bacteria. Later this word became a general term, taking in all of the different forms.

257. Identify the characteristics of the bacteria that are common to the oral cavity.

Oral flora are the bacteria found in the mouth. There are over a hundred types of bacteria found in the mouth alone. However, in this discussion only five of the most common types are included. Bacteria are micro-organisms and may be called by many names: microbes, micro-organisms, microflora, germs, and possibly "bugs." The term "oral flora" best describes the bacteria found in the mouth. Each bacterium (bacteria) is much like a tiny bit of living jelly surrounded by a clear, thin covering called a membrane. Are these bacteria animals or plants? The answer is that some bacteria are branched and sheathed like plants, but some have locomotive (movement) organs like animals. Thus, in the scheme of life they occupy an intermediary position between animals and plants, with the properties of both. Early bacteriologists agreed to classify bacteria as plants.

Bacteria abound everywhere; you name a place—any place around you—and you can correctly say that bacteria are found there. Bacteria are usually thought of as something that makes us sick, and very often they do; however, many kinds of bacteria are so useful that we could not live without them. As a result of years of scientific experimentation, many diseases can be cured by killing harmful bacteria; at the same time, many other types of bacteria are beneficial to mankind.

Categories of Bacteria. There are several different ways to categorize bacteria. Some are termed saprophytes and derive their nourishment from dead or decaying matter. These organisms for the most part do not cause disease. Other bacteria are categorized as parasites. These organisms live on or in other organisms, deriving their nourishment at the expense of the living host.

Parasitic bacteria that live in or on a host but do not cause serious damage are termed nonpathogens. Those that severely damage their host by destroying the host's tissues or causing serious infections are called pathogens. A pathogen that causes infection so severe that the host is permanently damaged, or that results in death of the host, is called a virulent pathogen. Nonvirulent pathogens damage the host, but damage is usually not permanent and rarely results in death of the host unless other underlying debilitating (weakening) conditions are present.

Bacteria are further categorized into three groups, based upon their need for oxygen. Anaerobic bacteria grow only in the absence of oxygen and, in the human mouth, are usually deep in the sulcus. Aerobic bacteria grow only in the presence of oxygen; that is, they must have oxygen to live. Facultative bacteria are the micro-organisms that can live under either aerobic or anaerobic conditions. These can be found deep in the sulcus or on the tongue. Each of these types of bacteria is found in infectious areas. Most bacteria cannot live in direct sunshine.

Bacteria are also distinguished as being either gram-negative or gram-positive. This refers to the staining method devised by Gram in 1884. When you use a phase microscope, you have no need for Gram stain. Although you will probably not use it, you should know in general what its terminology means, since it is frequently used. Stain is useful in the differentiation of bacteria. A smear is prepared, air-dried, and then stained with a primary violet stain, followed in order by a mordant (fixing agent), decolorizer, and counterstain. Some bacteria have the property of retaining the violet dye after having been treated with decolorizer and exhibit a pronounced purple or blue color throughout the process. These bacteria are called gram-positive. Those bacteria that lose their purple or blue color after decolorization are a pinkish red and are called mouth and respiratory tract. They are nonmotile and aerobic, and are arranged in pairs with their adjacent walls compressed, as shown in figure 4-1. The Neisseria group is primarily composed of two parasitic types of bacteria—the gonococci (which cause gonorrhea) and the meningococci (which cause meningitis).

d. Veillonella (va''-yon-el'-ah) are gram-positive cocci. They are strict anaerobes that physically resemble the Neisseria. It is not clear whether these organisms should be called pathogens. They have been frequently isolated from abscesses on teeth.

Bacilli (bah-sil'-i). These are a form of bacteria that you will see much of in your clinic. They are rod-shaped, about 3 or 4 microns long, and 1 micron in diameter. They can be spore-forming, gram-positive or nonspore-forming, gram-negative. Some are motile; some nonmotile. They are aerobic, anaerobic, or facultative. There are several types of bacilli, but the types of most importance are fusiform types (see fig. 4-1). Fusiforms are gram-negative, anaerobic bacilli, which inhabit the gingival sulcus and increase to large numbers when NUG (necrotizing ulcerative gingivitis) is present. They are very susceptible to antibiotics.

Spirilla (spi-ril'-ah). The most common spirilla oral flora are the vibrios (vib'-re-os). These are short, bent rods (see fig. 4-1). Each has a single polar flagellum (tail). They are either gram-positive or gram-negative and are anaerobic. They are found in severe disease—in deep gingival sulci and in pockets. They are extremely mobile. This little comma-shaped organism will be most helpful to you in motivating your patient toward better oral hygiene, because it will flip across the microscope field of vision like a speedboat, spinning and turning in every direction.

Filamentous (fil-ah-men'-tus) branching organisms. These are gram-positive, anaerobic, nonmotile, branching organisms. They are found around the teeth, in plaque, and in calculus. You will probably see two types of filamentous organisms. An illustration of filamentous branching organisms is shown in figure 4-1.

a. Leptothrix (lep'-to-thriks) are gram-positive, anaerobic, nonmotile, long-rod forms. The distinguishing feature between the Leptothrix and the rod-shaped bacilli is that the Leptothrix usually has a long branch from the end. Its shape resembles a bent twig.

b. Actinomyces (ak''-ti-no-mi'-sēz) are gram-positive, anaerobic, nonmotile, multibranching forms, and they are classified between fungus and bacteria. They most nearly resemble a small branch from a tree which has smaller branches from it. Actinomyces israelii (one of three pathogenic species of actinomyces) is the one found in the human mouth.

Spirochetes (spi'-ro-kēts). These anaerobic organisms are gram-negative. Their name, which means "coiled hair," is very descriptive of their form, as shown in figure 4-1. They are extremely motile and move in a corkscrew fashion. There are two types:

a. Borrelia (bo-re'-le-ah) *vincentii* are found in necrotizing ulcerative gingivitis (NUG) with the fusiform bacillus. They are comparatively small.

b. Treponema (trep''-o-ne'-mah) are larger spirochetes and are rather rare. They are extremely motile. The invasion of the *Treponema pallidum* spirochete results in syphilis.

Now that you have a general introduction to the scientific facts about oral flora, consider some pertinent statistics—both numerical and otherwise.

Prevalence of Oral Bacteria. Only once during your existence is your mouth without oral flora. The oral cavity of a fetus is sterile—but not for long. Shortly after birth, the oral cavity of a baby shows signs of oral flora. Soon the bacteria are flourishing. How?

Bacteria do not have seed, give birth, or lay eggs. Instead, each bacterium increases rapidly by dividing into two bacteria. Under proper conditions, some bacteria divide every 15 minutes. This means that, theoretically, in less than 1 day, one single bacterium can become more than 100 million bacteria! Actually, there are 40,000,000 to 5,500,000,000 organisms per cc of saliva—and we have about 10 cc of saliva in our mouths during our waking hours. In addition, there are many, many more organisms in contact with the teeth and soft tissues. The saliva is both an aid and a deterrent to the growth of bacteria. It aids in providing warm moisture, but some secretions in saliva provide a mechanical means of removing bacteria from the mouth, either by expectorating or swallowing.

The bacteria in an infant's mouth before tooth eruption are predominantly aerobic cocci and short-rod forms. With the eruption of teeth, the bacteria are able to work deep down into the sulcus. During this stage, the oral flora are predominantly anaerobic cocci and short-rod forms. When a person loses his teeth (becomes edentulous), he loses the deep crevices of the sulcus, and once more the bacteria are predominantly aerobic cocci and rod forms.

Other than the presence or absence of teeth, what else influences the predominance of either aerobic or anaerobic bacteria in one's mouth? Aerobic bacteria are prevalent with good oral hygiene; anaerobic bacteria are prevalent in areas of poor oral hygiene. The greatest number of oral flora are present just before the morning and evening meals. Rapid eating and drinking, expectorating, and using a mouthwash *temporarily* reduce oral flora, but remember how quickly they reproduce!

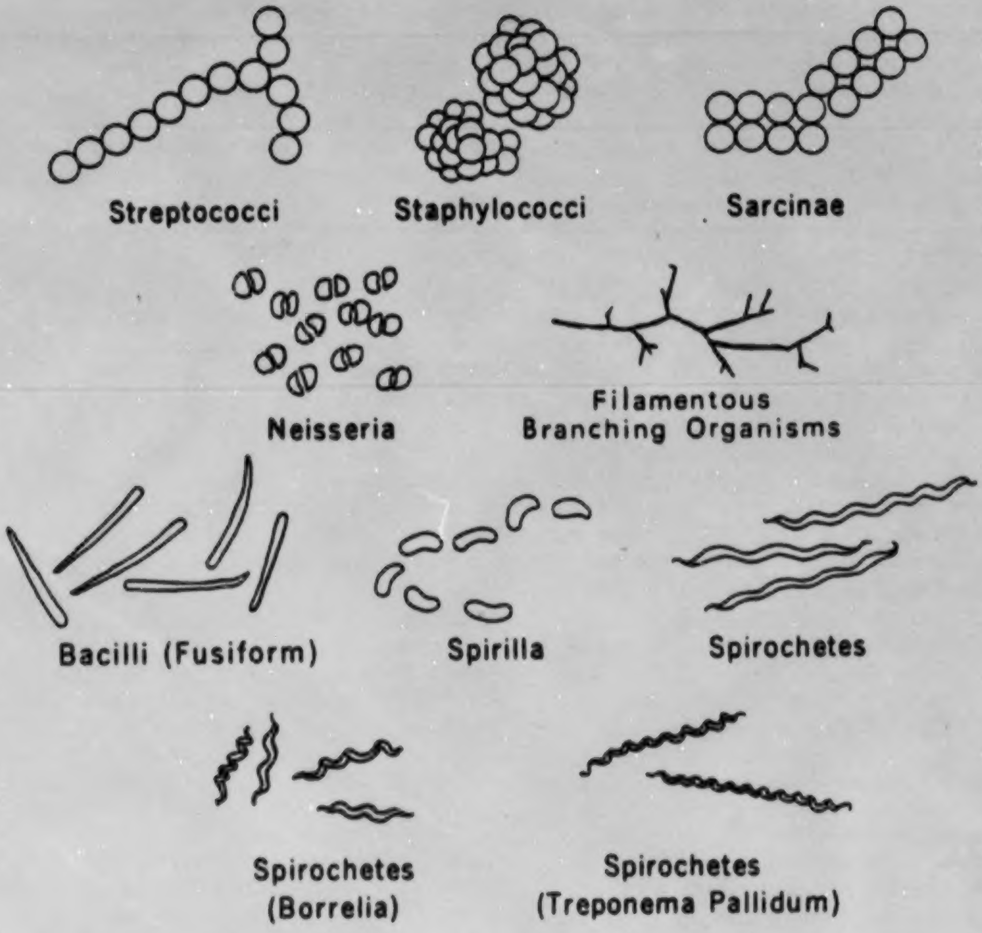


Figure 4-1. Bacterial forms.

gram-negative. The staining process kills the bacteria, and they cannot be as effectively used in motivating your patient to keep a clean mouth as live specimens, which perform all sorts of antics under a microscope. For this reason, the phase microscope—which permits viewing of live bacteria—is effectively used in preventive dentistry counselings.

Forms of Bacteria. Bacteria have many different shapes and forms, as shown in figure 4-1. However, oral bacteria (normal flora) are reduced to five forms for discussion here. This discussion is a superficial explanation of bacteria found in the oral cavity—it presents only that information that may be useful to you in motivating your patients toward better oral health.

Cocci (kock'-sigh). The cocci forms are usually gram-positive, nonmotile, and facultative. They are spherical or oval-shaped and are about 1 micron (1/1000 mm) in diameter. The cocci forms exist singly or in aggregate (in chains or in colonies with clusters of varied shapes). You should be able to recognize the following types of cocci:

a. Streptococci (strep''-to-kok'-i), the most common of all the oral bacteria, is gram-positive and facultative. Figure 4-1 shows that it grows in chains. It does not usually cause disease unless it settles on abnormal heart valves (causing subacute bacterial endocarditis), in urinary tracts, or in the meninges (one of the membranes enveloping the brain and spinal cord). But varieties of streptococci have recently been implicated in the caries process.

b. Staphylococci (staf''-i-lo-kok'-i) are gram-positive, facultative, and grow in clusters. They are nonmotile and are often found on the epidermal surfaces of human beings. They cause osteomyelitis, boils, abscesses, and ulcers. Some food poisoning is caused by staphylococci. However, they produce various enzymes that are necessary for some normal body functions.

c. Neisseria (ni-se'-re-ah) are gram-positive cocci, usually occurring in pairs. They occur in the

To prevent uneven wear of the stone, the sides as well as the middle should be used for sharpening instruments. The instrument should be drawn over the stone with a long, firm stroke. Be sure to maintain the correct bevel of the instrument. Instruments used for cutting soft structures usually have long, thin bevels, and those used for cutting hard structures have short bevels. Always draw the instrument toward the bevel of the cutting edge. The cutting edge is produced when the instrument is drawn across the stone at an angle. The edge has length but no thickness.

Instrument Sharpening. You can divide dental cutting instruments into groups for sharpening. These groups are the instruments with flat, beveled working edges, those with curved working edges, and finally those with irregular working edges. It is very important that you be accurate in sharpening dental instruments. That is, the instrument cutting surface should be restored as nearly as possible to the original cutting edge. Inaccurate sharpening can ruin an instrument. The correct bevel or curvature on an instrument makes it most effective. Exercise extra care to assure that the correct bevel or curvature is maintained.

The instruments with flat, beveled working edges should be sharpened on a flat Arkansas stone. Place the blade on the stone so that it forms approximately a 45° angle. Pull the blade back and forth across the stone with a firm, even stroke until it is sharp.

Some instruments with a curved working edge may be sharpened on a grooved Arkansas stone. The spoon excavators, elevators with spoon-shaped working edges, and some scalers are included in this group. The grooves in the stone are rounded and of different sizes. Be sure to use the groove of the proper size. To sharpen these instruments, place the working end in the proper groove and draw the instrument away from the cutting edge. When you check these instruments for sharpness, make sure that the curved working edge is smooth and perfectly shaped.

The final group of instruments to be discussed are those with irregular working edges. The explorers, curettes, extraction forceps, some elevators, and most of the scalers are included in this group. Use the shape of the old cutting edge as your guide. To sharpen them, you must use mandrel-mounted stones. These stones come in various sizes to make it easier to reach the almost inaccessible areas of the cutting edge. You should select the size that fits the working edge of the instrument and place it in the handpiece. Then hold the instrument with the working edge toward you. Rotate the stone slowly in a clockwise direction. With practice, the task becomes much easier.

A fairly recent addition to the *Federal Supply Catalog* has made mandrel-mounted sharpening stones easier to use. This addition is called a dental instrument sharpening guide. It consists of a sheath which fits a roundnose dental handpiece and accommodates a mandrel-mounted sharpening stone. It also features a T-shaped dental instrument rest, an adjustable chuck for positioning this T-shaped rest, and a swiveling arm which connects the chuck to the sheath. This guide can be a tremendous aid to you in keeping irregular-surfaced instruments sharp. The dentist depends upon you to keep all cutting instruments sharp. Thus, any and all available sharpening aids may, and perhaps should, be used.

Exercises (258):

Complete the following exercises by circling either the T or the F to indicate whether the statement is true or false.

T F 1. The sharp edge of an instrument will reflect light.

T F 2. Before sharpening instruments, it is important to oil the surface of the Arkansas stone to prevent its pores from becoming embedded with metal filings.

T F 3. You can restore the surface of a glazed Arkansas stone by soaking it in hydrogen peroxide.

T F 4. When sharpening instruments on a flat Arkansas stone, you should always draw the instrument away from the bevel of the cutting edge.

T F 5. Instruments with a curved working edge should be sharpened on a flat Arkansas stone.

T F 6. Mandrel-mounted stones are effectively used to sharpen instruments with irregular working edges.

T F 7. When sharpening instruments with a mandrel-mounted stone, you should run the handpiece slowly.

4-4. Sterilization and Disinfection of Instruments

One of your greatest responsibilities to the dental patient is to maintain proper cleanliness, sterilization, and disinfection of dental instruments. As you have already learned, instruments of various designs and materials are used in the dental clinic. Each has characteristics different from the others. These characteristics make it impossible to use any one particular method of sterilization. In this section, we discuss the various types of sterilization and disinfection.

259. Define sterilization and identify the procedures, methods, and equipment involved in the sterilization of dental instruments.

Exercises (257):

Complete the following exercises by circling either the T or the F to indicate whether the statement is true or false.

T F 1. Early bacteriologists agreed to classify bacteria as animals.
T F 2. Some bacteria are a benefit to mankind.
T F 3. Saprophytes derive their nourishment from dead or decaying matter and for the most part do not cause disease.
T F 4. Parasitic bacteria that live in or on a host and severely damage their host by destroying tissues or causing serious infections are called pathogens.
T F 5. Nonvirulent pathogens usually cause a permanent damage to the host and often result in death.
T F 6. Anaerobic bacteria are those that must have oxygen to survive and grow.
T F 7. Facultative bacteria are those that can live under either aerobic or anaerobic conditions.
T F 8. Bacteria that lose their purple or blue color after the discoloration step of the gram-staining process and become a pinkish red are called gram-positive.
T F 9. Streptococci are the most common of all oral bacteria.
T F 10. Staphylococci have been recently implicated in the caries process.
T F 11. Members of the Neisseria group of bacteria are responsible for gonorrhea and meningitis.
T F 12. Fusiforms are gram-negative, anaerobic bacilli which inhabit the gingival sulcus and increase to large numbers when NUG is present.
T F 13. The most common spirilla oral flora are the comma-shaped vibrios.
T F 14. The Leptothrix and the Borrelia are examples of filamentous branching organisms.
T F 15. Invasion of the *Treponema pallidum* spirochete results in syphilis.
T F 16. Bacteria reproduce by laying eggs.
T F 17. Bacteria found in edentulous mouths are predominantly aerobic cocci and rod forms.

4-3. Sharpening Dental Instruments

Just as a pocketknife or a paring knife requires sharpening from time to time, so it is with dental cutting instruments. In fact, this requirement is even more critical with dental cutting instruments. You may use a dull pocketknife to carve a piece of wood with little consequence. About the only difference in using a dull pocketknife or dull paring knife is that a dull knife makes the carving harder and takes more time. When dealing with dental instruments, however, the requirement is critical because they are used on human beings. A sharp instrument makes the dental officer's work easier and lessens, by far, the trauma that is needlessly inflicted with dull instruments.

258. Identify the procedures and equipment involved in sharpening dental hand instruments.

To recognize the sharpness of an instrument requires that you give each instrument a sharpness test. One way of testing the sharpness is to look at each instrument's cutting edge through a magnifying glass. (Use over-the-shoulder lighting.) A sharp edge shows as a fine line rather than a surface. Also, the sharp edge reflects no light. Another way is to slide the cutting edge over your fingernail. A dull instrument will not cut the nail and needs sharpening.

Care of the Sharpening Stones. Before sharpening instruments, you must properly prepare the sharpening stone by coating its surface with a light machine oil. If you neglect this step, metal filings from the instruments become embedded in the dry pores of the stone. This forms a glaze that makes the stone ineffective. Also, when you finish sharpening instruments, be sure to remove the oil film and metal filings, or they will be absorbed and cause the stone to become glazed. The stone should never be permitted to become glazed; however, if you do have a glazed stone, you can restore its abrasive surface by soaking it in an ammonia-water solution. If the stone is flat, you can restore its abrasive surface by rubbing it with a fine grade of emery cloth on a wooden block.

Sharpening stones are available in two types—the Arkansas stones and the carborundum stones. There are two styles of Arkansas stones. One is a flat 2- by 8-inch stone, and the other is a grooved stone. The grooved stone is particularly useful when sharpening instruments having curved or disc-shaped cutting edges. The carborundum stones are usually mandrel-mounted for use with the conventional speed handpiece.

The hard Arkansas stone is an oilstone, with a surface that permits free honing movements. Close examination of the stone reveals a surface consisting of a mass of tiny crystals. These crystals act as little, sharp cutting points. When we sharpen an instrument, we are actually recutting it into shape. The hard Arkansas stone is preferred for the following reasons:

(1) The point of the instrument may catch in the carborundum stone and ruin both instrument and stone.
(2) The surface of the Arkansas stone is not easily grooved and will remain an effective sharpener for a longer period of time.

Before instruments are sterilized, they should be cleaned. The usual cleaning procedure is to scrub the instruments, using a scrub brush and soapy water. They must then be rinsed with clean water and dried to prevent water spotting. Once clean, the instruments are then ready to sterilize. The methods of sterilization include the steam pressure autoclave, dry heat, and heat transfer sterilization.

Sterilization. Sterilization is the destruction of micro-organisms. Micro-organisms contaminating various objects can be killed by exposure to high temperatures. Resistance of bacteria to extremes of temperature depends upon the species, the growth stage, and whether or not the bacteria produce spores. Bacterial spores have a much greater resistance to high temperatures than do vegetative forms. There are bacterial test packs and indicators available which are used to confirm that proper sterilization temperatures have been reached.

When supplies or instruments are to be sterilized in packs, they are usually wrapped in muslin or specially prepared paper. Always use a piece of material large enough to completely cover the contents. The muslin should be of double thickness. Place the wrapper on the table with one point toward you. Center the items on the wrapper. Fold over the corner nearest you, then the right and left corners, and finally the corner opposite you. *Always* turn the tips of the corners back so that the pack may be unwrapped without touching the contents. Try to make firm, compactly wrapped packages. Place a sterilization temperature indicator in the middle of the package, label the package, and secure it with pressure-sensitive tape. See figure 4-2 for a sterilization indicator. Many times, the labeling is done on the tape. Further, pressure-sensitive tape has light marks which turn dark when subjected to heat under pressure. It provides another way to confirm that the pack has been autoclaved. The largest pack for the floor-mounted autoclave should be not more than 12 by 12 by 20 inches.

Autoclave method. Steam under pressure (autoclaving) is the most effective and practical method for sterilization of dental instruments. Normally, autoclaving is done in dental treatment rooms, where a rapid and sure method is routinely required. The autoclaves used in treatment rooms are usually fairly small, portable types. A larger, floor-mounted type is frequently used in the oral surgery section. The autoclave is basically a pressure cooker. It is a cylinder with a door attached, through which instruments can be passed. It is equipped with valves to control the entry and exit of steam and with monitoring and timing devices that allow you to observe the autoclave in operation. Steam for the autoclave may be supplied from a central point, or by water heated to boiling by electric coils within the chamber itself.

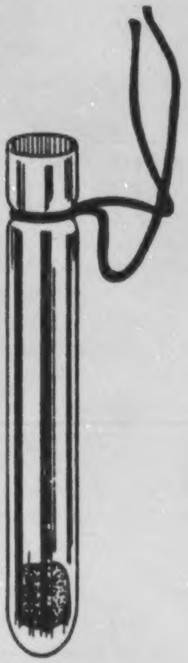


Figure 4-2. Sterilization indicator.

When the cylinder of an autoclave is filled with steam under pressure, the temperature rises as the pressure increases. Ordinarily, autoclaving at 121° C. (250° F.) at 15 pounds pressure for 15 to 20 minutes will suffice. Follow the manufacturer's instructions if there is a variance on the high side with respect to time or temperature. These autoclaves must be placed on a solid surface, with the electric cord out of the traffic area. Each autoclave has a mark inscribed to indicate the correct water level. Distilled water must be added to bring the fluid up to this level prior to each use of the autoclave.

Carefully follow the instructions printed on the equipment data plate when you start the autoclave and also later when you open the autoclave after the sterilizing period. The interior must be completely cleaned at weekly intervals. If you fail to use distilled water, a scale will form on the interior surface. Light scale may be removed with soap and a stiff brush. Removal of heavier scale requires the addition of one-half cup of vinegar to the water. Operate the empty autoclave through a regular sterilizing cycle and then remove the vinegar water. Ventilate sufficiently to remove the offensive odor. Rinse and refill to the correct level with distilled water.

In an autoclave, steam serves as a medium for the transmission of moist heat from a source of energy to the objects to be sterilized. When it touches these cooler objects, the steam condenses to moisture as its heat energy is absorbed. More and more steam enters, and the temperature of objects rises until they are as hot as the steam. Micro-organisms are killed by this heat.

Cleaned instruments or sets of instruments may be individually wrapped in muslin, or they may be placed in paper bags or polyethylene tubing prior to autoclaving. They may be autoclaved in covered pans or trays in which they are also stored. Do not crowd the autoclave. Leave space between packs for circulation of steam. Containers that might retain condensed water should be placed on their sides with their lids alongside them. The lids can then be picked up and replaced without contamination after sterilization is completed.

To remove materials from the autoclave, turn the operating valve to exhaust at the end of the timed period. When the chamber gauge shows zero pressure, unlock the door, but do not open it wide. Loosen it just enough to permit vapor to escape. Leave the door cracked for a minimum of 10 minutes to allow the load to dry. Once the door is cracked, a sign reading STERILE should be hung on the door while the materials finish drying. After the 10 minutes have elapsed, you may open the door and remove the load. Set the packs on a rack to dry. Do not place warm packs on a flat, solid surface or on a metal surface, because condensation will wet the pack and cause contamination.

Sterilization indicators can be used to indicate whether the machine is operating correctly. On a day-to-day basis, you may use pellet indicators in the center of the sterilizing chamber and in each pack. The color of the pellets changes if there is sufficient heat. You may bind packs and paper envelopes with pressure-sensitive tape that changes color after proper exposure to heat. At least once each month, you should use bacterial culture tests or "spore strips" for positive checking of the autoclave. These strips are impregnated with spores that require a minimum exposure of 250° F. and 15 pounds of pressure for 12 minutes to kill them. You send the strips to the laboratory after autoclaving for a culture and microscopic examination. A negative report of bacterial growth shows effective autoclaving.

Dry heat method. Dry heat sterilization is a clinically approved method that effectively sterilizes all instruments used in dentistry. It should be substituted for the steam pressure sterilizing method when it is essential to preserve cutting edges or to sterilize instruments where rust is a factor. This method is not used under normal circumstances, because it takes approximately four times as long to sterilize by the dry heat method as it does by the steam method.

A small electric oven is used to sterilize with dry heat. The standard for a dry heat oven is 180° C. (350° F.) for 1 hour. There is little maintenance for these ovens other than normal dusting—and using commonsense. CAUTION: Cotton, paper, plastic, and rubber may melt, scorch, or burn at sterilizing temperatures. Be careful what you place in these ovens. Ovens and autoclaves should be checked for effectiveness by using indicators that change color at sterilizing temperatures. These indicators come in the form of bags, tapes, and small glass vials. If any of these indicators fail to turn to the proper color, the medical equipment repairman should be called to check the equipment.

Remember, an instrument is hot enough at sterilizing temperatures to give a severe burn if touched. Allow sufficient time for the sterilizer to return to room temperature before removing instruments.

Heat transfer sterilization. Many dentists sterilize small instruments, such as root canal instruments, at the dental chair with a small, heat transfer sterilizer, usually called a "bead sterilizer." This sterilizer uses the principle of "flash" sterilization, subjecting the item being sterilized to intense heat (424° F. to 532° F.) for between 3 and 10 seconds. This electrically heated sterilizer uses glass beads, salt, or molten metal as the heat transfer medium. Be cautious when moving these sterilizers so that you will not be burned.

Exercises (259):

1. How should you clean dental instruments prior to sterilization?

2. Define sterilization.

3. What factors have a bearing on a bacteria's resistance to temperature extremes?

4. When wrapping instruments in a sterilization pack, why should you turn the corner tips of the wrapper back?

5. What is the most effective and practical method for the sterilization of dental instruments?

6. What is normally considered sufficient temperature, pressure, and time for autoclaving?

7. Why should you use distilled water in the autoclave?

8. When placing packs in an autoclave, why is it important not to crowd the autoclave?

9. Why should you not place warm (recently sterilized) packs on a flat, solid surface or on a metal surface?

10. How often should spore strips be used for positive checking of the autoclave?

11. Why isn't the dry heat method of sterilization used under normal circumstances?

12. Why must you be careful of the items you place in the dry heat sterilizer?

13. Give three examples of transfer media that may be used in the heat transfer sterilizer.

14. Which sterilizer uses the principle of "flash" sterilization?

260. Identify the disinfection process, media, and procedures used by the dental service.

Disinfection. There are times when sterilization may not be possible. For example, during battlefield conditions, electricity may not be available to operate sterilizers. Even when sterilizers are operable, there are some articles that would be damaged by heat and therefore cannot be sterilized. When such cases occur, disinfection must be used in lieu of sterilization.

Disinfection is a procedure in which all but spore-forming micro-organisms are destroyed. Disinfection may be achieved by either physical or chemical means. In choosing the method of disinfection for various types of equipment, you must consider the composition of the article concerned.

Physical method. Physical disinfection is accomplished with boiling water. This technique should not be used except as a temporary expedient. While disinfection by this method will destroy all vegetative micro-organisms, the spore-forming bacteria are usually not destroyed. You should *never* rely on this method as a sterilizing process.

The boiling water technique requires heating some type of vessel filled with water. The temperature of the water is regulated by the amount of applied heat. The maximum temperature that can be reached is the boiling point, 100° C. (212° F.). Thirty minutes of continuous boiling is necessary to disinfect the instruments. Then, if you add a group of instruments to a partly disinfected group, you contaminate both groups. You must restart the timed period when you add the new group. Another point to remember is that instruments having sharp cutting edges or delicate mechanical parts should not be placed in boiling water. Prolonged exposure to heat will destroy the temper in cutting instruments and make it impossible to keep a sharp cutting edge.

Chemical method. Chemical disinfection is used for those articles that may be damaged by heat. When disinfecting with chemicals, the article surface must be absolutely clean. If it is not, the chemical agent will not be effective. Thorough cleaning of the article reduces the number of bacteria and removes the material that affords the bacteria protection.

The use of chemical disinfectants should be kept to a minimum. The most commonly used substance is a solution of zephiran chloride 1:1000 (with antirust). Bathe the instruments in this solution for at least 30 minutes.

Alcohol is another chemical agent sometimes used. However, pure alcohol has very little value as a disinfectant. When it is diluted with distilled water, it will inhibit the growth of bacteria. This may seem strange, but it can be easily explained. Alcohol stops the growth of bacteria cells by a process of coagulation of the vital material of the cell. When it is applied in full strength, it coagulates the cell wall first. This prevents the alcohol from penetrating into the vital center of the cell. Diluted alcohol does not coagulate the cell wall as completely, thus permitting the alcohol to penetrate into the vital center of the cell and destroy it. The ideal concentration of alcohol is a 70-percent solution. A solution of less than 50 percent or greater than 80 percent is of little value as a disinfectant.

There are numerous other chemical preparations that may be used for disinfection, such as merthiolate, metaphen, mercresin, mercurochrome, and various iodine solutions. There are still others, but they require an extended period of time to kill vegetative bacteria and are not routinely used since there are more acceptable chemical agents. The final consideration we give to maintaining instruments is the storage requirement.

Exercises (260):

Complete the following exercises by circling either the T or the F to indicate whether the statement is true or false.

T F 1. Disinfection is a process that kills all micro-organisms.
T F 2. It is safe to rely on boiling water as a sterilizing process.
T F 3. Instruments submerged in boiling water for a period of 30 minutes can be considered adequately disinfected.
T F 4. Boiling water is the best method of disinfection for instruments with sharp cutting edges.
T F 5. Instruments being disinfected in zephiran chloride should remain in the solution for 10 to 15 minutes.
T F 6. The ideal concentration of alcohol for use as a disinfectant is 90 percent.

4-5. Storage of Instruments

Because of the variation of treatments rendered in a dental treatment room, it is necessary to have many dental instruments available. In turn, this large number of instruments requires that a system be established to group some and store others where they can be easily identified and accessible.

261. State the safeguards and procedures involved in storing dental instruments.

Instrument Packs. One way of grouping instruments is to place them in packs or on trays, which are then wrapped. Surgical instruments are frequently sterilized and stored in packs. There is no standard system for storing packs. However, all instruments are usually stored in some type of an instrument cabinet.

Date the sterile packs after they are removed from the autoclave by marking the outside wrapper with a washable marker. Never date a pack before it is autoclaved. Supplies should be marked to show the date when the sterilized article is no longer considered safe to use. The time span for which an article can be considered sterile depends primarily on its wrapping. Some wrappings provide freedom from contamination for as much as 6 months, while other provide as little as 2 weeks' protection. Check with your dental officer or the hospital central supply service to determine the sterilization expiration dates for your particular type of packs. Place all sterilized packs in their proper locations. They should be clean, dry, and free from dust. Place like items together and arrange them according to expiration date, placing items with later dates toward the rear. Check supplies periodically to determine any necessity for reautoclaving. Items must be resterilized if the wrapper becomes wet, if the pack touches the floor, if there is any question of contamination, or if the safe storage period has expired.

Instrument Cabinets. Instruments not kept in packs are normally stored in dental instrument cabinets. Due to the wide variety of cabinets found in dental clinics, there is no standard storage procedure established. The general practice is to follow the storage procedures already in effect at a given base or arrange the cabinet to meet the desires of your dental officer. Ordinarily, all instruments are to be cleaned, sterilized, and placed in a specified drawer or tray of the instrument cabinet at the close of each duty day. You are to assure that these drawers and trays are disinfected at least weekly and more often if needed. If in doubt, ask your NCOIC or the dental officer you assist.

Exercises (261):

1. When should sterile packs be dated?

2. What is of primary concern when determining how long an article can be considered sterile?

3. What should you do if the wrapper of a sterilized pack becomes wet?

4. How often should you disinfect the drawers and trays of the instrument cabinet?

ANSWERS FOR EXERCISES

CHAPTER 1

Reference:
200 - 1. d.
200 - 2. e.
200 - 3. n.
200 - 4. k.
200 - 5. a.
200 - 6. l.
200 - 7. j.
200 - 8. b.
200 - 9. m.
200 - 10. i.
200 - 11. c.
200 - 12. h.
200 - 13. f.
200 - 14. g.

201 - 1. The boundaries of the roof of the mouth, the floor, and outer walls of the nasal cavity and the floor of each orbit.
201 - 2. b.
201 - 3. d.
201 - 4. a.
201 - 5. c.
201 - 6. The maxillary tuberosity is a small, rough prominence located just behind each maxillary third molar area.
201 - 7. The hamular notch.
201 - 8. They allow nerves and blood vessels to pass in and out of the maxilla.
201 - 9. d.
201 - 10. c.
201 - 11. a.
201 - 12. b.
201 - 13. The mandible.
201 - 14. On the superior border of the body of the mandible.
201 - 15. These are the mental foramina that allow nerves and blood vessels to exit to the soft tissues of the chin.
201 - 16. The genial tubercle is located on the internal surface of the mandible, opposite the chin, and at the midline. It serves as an attachment for genioglossus muscle.
201 - 17. The mylohyoid ridge is a bony ridge that starts just behind the genial tubercles and extends backwards and upward on each inner side of the mandible ending in the third molar area. It serves as an attachment for the mylohyoid muscle that forms the floor of the mouth.
201 - 18. The rami.
201 - 19. This is the coronoid process. It serves as an attachment for the muscles of mastication.
201 - 20. The temporomandibular joint.
201 - 21. The mandibular notch.
201 - 22. Behind the last tooth.

202 - 1. a.
202 - 2. d.
202 - 3. b.
202 - 4. c.
202 - 5. e.
202 - 6. f.
202 - 7. b.
202 - 8. e.
202 - 9. g.

203 - 1. T.
203 - 2. T.
203 - 3. F.
203 - 4. F.
203 - 5. T.
203 - 6. F.
203 - 7. T.
203 - 8. T.
203 - 9. T.

204 - 1. Provides a special sense of taste, helps perform functions of speech, contains elements of mastication, and serves as the entrance to the alimentary canal.
204 - 2. Vestibule.
204 - 3. The vestibule lies between the lips, cheeks, and teeth.
204 - 4. The maxilla, mandible, and palatine bones.
204 - 5. a. The palate forms the roof of the mouth.
b. It includes both the hard and soft palate.
204 - 6. Look at its color—healthy mucous membrane is pink; diseased mucous membrane varies from a bright red to a pale pink.
204 - 7. Dorsal; tongue.
204 - 8. a. Sweet; sour.
b. Sour.
c. Bitterness.
d. Main source of taste sensation.
204 - 9. The property of free movement and elasticity.
204 - 10. d.
204 - 11. c.
204 - 12. b.
204 - 13. a and h.
204 - 14. f.

205 - 1. The trigeminal nerve (fifth cranial) is the main nerve supply of the oral cavity.
205 - 2. The ophthalmic, maxillary, and mandibular.
205 - 3. Alveolar; third; second; molar.

205 - 4. The middle superior alveolar branch of the trigeminal nerve.
205 - 5. Incisors; central; anterior.
205 - 6. The mandibular.
205 - 7. Facial.
205 - 8. The five terminal branches of the facial nerve are as follows: temporal, zygomatic, buccal, mandibular, and cervical.

206 - 1. Arteries.
206 - 2. Veins.
206 - 3. Pulmonary.
206 - 4. Capillaries.
206 - 5. Neck; carotid.
206 - 6. Hyoid; external.
206 - 7. Lingual.
206 - 8. Ear; maxillary; temporal.
206 - 9. Jaw; teeth; tissues.
206 - 10. Alveolar; foramina; mental.
206 - 11. Bicuspid; sinus, gingiva.
206 - 12. Hard.
206 - 13. Infraorbital.
206 - 14. Anterior; cuspids; bone.

207 - 1. Lymph, lymph vessels, and lymph nodes.
207 - 2. It is an almost colorless liquid that is derived from blood plasma as it leaks into spaces between the tissue cells. It is similar in composition to blood plasma.
207 - 3. To combat baterial infection by transporting disease-producing organisms to the lymph nodes, to carry off excessive fluid from the body tissues, and to act as a supplement to the venous system.
207 - 4. Toward the heart.
207 - 5. They resemble veins in that they start as small vessels and have the same type of duct linings.
207 - 6. They are small oval-shaped bodies that lie along the course of the lymph vessels. Usually, they occur as groups and act as filters to remove bacteria and other particles from the lymph system.

208 - 1. F.
208 - 2. F.
208 - 3. T.
208 - 4. T.
208 - 5. F.
208 - 6. T.
208 - 7. F.
208 - 8. T.
208 - 9. F.
208 - 10. T.
208 - 11. F.
208 - 12. T.
208 - 13. T.

209 - 1. T.
209 - 2. F.
209 - 3. T.
209 - 4. F.
209 - 5. T.
209 - 6. T.
209 - 7. F.
209 - 8. T.
209 - 9. F.
209 - 10. T.
209 - 11. T.
209 - 12. F.
209 - 13. a. T.
b. F.
c. T.
d. F.
209 - 14. T.

210 - 1. n.
210 - 2. h.
210 - 3. c.
210 - 4. a.
210 - 5. b.
210 - 6. m.
210 - 7. b.
210 - 8. o.
210 - 9. p.
210 - 10. i.
210 - 11. j.
210 - 12. g.
210 - 13. k.
210 - 14. f.
210 - 15. l.
210 - 16. b.
210 - 17. g.
210 - 18. d.
210 - 19. e.

211 - 1. a. Periodontium.
b. The periodontal ligament, the alveolar process, and the gingiva.
211 - 2. Formation, nutrition, sensation, and support.
211 - 3. To support the teeth and yet permit a certain amount of tooth movement.
211 - 4. Alveolar process.
211 - 5. It gives the alveolar process shape, yet protects the softer bones and tissues inside.
211 - 6. It is a porous, spongy type of bone composed of a network of narrow spaces, spicules, blood and lymph vessels.
211 - 7. Free gingiva lies close to the crown just above the cervix; the attached gingiva covers the alveolar bone.

CHAPTER 2

Reference:
212 - 1. Dental caries.
212 - 2. Bacteria.
212 - 3. Dental plaque is a filmlike covering on teeth surfaces that is composed of mucus, sloughed-off tissue cells, and different types of bacteria. All dental caries begin when plaque deposits on tooth surfaces become laden with bacteria.
212 - 4. The acidogenic theory.
212 - 5. Dental plaque.
212 - 6. A sign of a disease is an objective manifestation. The examiner can positively determine a sign; swelling is an example. A symptom of a disease is a subjective manifestation. Only the patient can positively identify a symptom; pain is an example.
212 - 7. These are caries that begin in the enamel and then stop for some unknown reason.
212 - 8. As a leathery or spongy mass.
212 - 9. The secondary dentin acts as a protective lining or insulator for the pulp tissue.
212 - 10. Sensitivity to cold foods or liquids.
212 - 11. By dental restorations.

213 - 1. Inflammation of the pulpal tissue.
213 - 2. Extensive dental caries.
213 - 3. It is an inflammatory condition of the pulp chamber due to a systemic disease, and it is a secondary effect of a more prominent disease of the body.
213 - 4. Pain is increased by heat, pressure, and percussion; it is also greater when the patient is lying down.

213 - 5. Dull, obscure pain; usually, no pain with percussion, very little pain with heat.
213 - 6. The pulp may die.
213 - 7. It is usually treated by removing the irritant and inserting a temporary filling.
213 - 8. In some cases, the necrotic pulp may be removed and replaced with a suitable root canal filling material. In other cases, the tooth must be extracted.

214 - 1. An abscess is a condition in which pus, caused by tissue disintegration, collects locally in a body cavity and is surrounded by resulting inflamed tissue.
214 - 2. Either an acute or a chronic periapical abscess is formed when there is a localized collection of pus at the apex of a tooth.
214 - 3. The acute periapical abscess area becomes extremely painful; this pain increases when heat is applied but decreases when cold is applied. Generally, the chronic periapical abscess is less painful, occurring only when pressure (in a certain direction) is applied. With the acute periapical abscess, the surrounding tissues become swollen or red; but with the chronic periapical abscess, there is little redness or swelling.
214 - 4. First, root canal therapy; second, removal of the infected tooth.
214 - 5. Such foreign body irritants as calculus formation, overhanging or fracture fillings, impacted food, or broken toothpicks become embedded between the tooth and the soft tissue, or completely within adjacent soft tissue.
214 - 6. No appreciable change in the pain.
214 - 7. Normally, the onset of cellulitis is signified by edema of the soft structure (often extensive), severe pain and throbbing, high fever (around 105° F.), rapid pulse and headaches, and spasm of the involved masticatory muscles.

215 - 1. Pericoronitis.
215 - 2. Bacteria.
215 - 3. Trismus.
215 - 4. Operculum.
215 - 5. Remove.

216 - 1. Pathology.
216 - 2. Asymptomatic.
216 - 3. Retained roots; foreign chronic irritant.
216 - 4. Clear liquid.
216 - 5. Developmental sac; formations.
216 - 6. Surgical excision; curretage; rest cells.

217 - 1. It is a mass of granulation tissue that is usually surrounded by a fibrous sac.
217 - 2. A chronic inflammation.
217 - 3. At the tooth's apex.
217 - 4. The tooth may be sensitive to percussion, feel slightly elongated, and cause a dull gnawing pain.

218 - 1. Inflammation involving the gingival tissue.
218 - 2. a.
218 - 3. c.
218 - 4. f.
218 - 5. b.
218 - 6. d.
218 - 7. e.

219 - 1. An inflammatory reaction of the tissue surrounding and supporting a tooth, including the periodontal membrane, the alveolar bone, and the gingiva.
219 - 2. The patient's breath is usually foul. Irritants may or may not be present. There may be exudate in the depth of the pocket. In the beginning stages, the interproximal bone shows slight blunting. In advanced cases, there is a horizontal loss of bone and a cupping-out of the interdental bone.
219 - 3. Treatment for periodontitis consists of one or more of the following: (a) education of the patient, (b) conservative scaling and curettage, (c) gingival surgery and possibly osteosurgery, and postsurgical treatment which may include occlusal equilibration.
219 - 4. When these two events occur, the inflammation passes the periodontal ligament fibers, and the supporting structures of the tooth begin to break down.
219 - 5. Periodontosis is an abnormal condition (degeneration) of the periodontia, but initially there is no inflammatory reaction involved.
219 - 6. Widening of the periodontal spaces and migration of the teeth is apparent in the early stages. The first sign of inflammatory involvement is seen in the second stage. The third stage is characterized by progressive gingival inflammation, deeper periodontal pockets, increased bone loss, and the loosening and drifting of teeth. Neither pocket formation nor bone loss is part of the beginning stages but is seen in the later stages.
219 - 7. Treatment for periodontosis consists of educating the patient toward good oral hygiene and cleaning his mouth thoroughly; then the dental officer treats the patient according to his needs.

220 - 1. F.
220 - 2. F.
220 - 3. T.
220 - 4. T.
220 - 5. F.
220 - 6. F.
220 - 7. T.

221 - 1. T.
221 - 2. T.
221 - 3. F.
221 - 4. T.
221 - 5. F.
221 - 6. F.
221 - 7. T.
221 - 8. F.
221 - 9. T.
221 - 10. T.

222 - 1. The bacillus *Mycobacterium tuberculosis.*
222 - 2. It may be spread through the bloodstream or by direct contamination of an abrasion or wound in the mucosa. If the oral lesion is the primary site, it may be caused by direct contact of the tissue with an infected instrument.
222 - 3. On the lateral borders of the tongue.
222 - 4. Oral lesions frequently begin as a small tubercle or pimple which breaks down to form painful ulcers. Additional tubercles form in the same manner; the process repeats over and over, and the lesions grow in size.
222 - 5. The maintenance of good oral hygiene and the elimination of all areas that might be a source of irritation to the tissues.
222 - 6. Rubber gloves and the strictest aseptic techniques are mandatory.

223 - 1. a.
223 - 2. b.
223 - 3. c.
223 - 4. f.
223 - 5. a.

223 - 6. c.
223 - 7. d.
223 - 8. e.

224 - 1. F.
224 - 2. T.
224 - 3. T.
224 - 4. F.
224 - 5. T.

225 - 1. b.
225 - 2. e.
225 - 3. a.
225 - 4. c.
225 - 5. d.

226 - 1. Thermal and chemical.
226 - 2. Thermal.
226 - 3. By keeping heated materials and instruments out of the operating area until they are in a safe temperature range.
226 - 4. By placing an aspirin tablet in the mucobuccal fold next to a tooth that hurts.
226 - 5. That it should be swallowed to give the beneficial effect intended.
226 - 6. Know the contents of all the medicament bottles in the operatory; be able to describe the properties and precautions necessary for handling, neutralizing, and storing these substances; label all containers; make positive identification of all drugs and chemicals; be very careful in handling all chemicals.

227 - 1. T.
227 - 2. T.
227 - 3. F.
227 - 4. F.
227 - 5. T.
227 - 6. F.
227 - 7. T.
227 - 8. T.
227 - 9. T.

228 - 1. Early stabilization aids in the control of shock, pain, swelling, trismus, and hemorrhage. It also has a direct bearing on the reestablishment of a normally functioning masticatory system and on the esthetic results.
228 - 2. A simplified technique of intermaxillary fixation supplemented by a head bandage for the support of the mandible.
228 - 3. Select at least two suitable posterior teeth in each quadrant for wiring. Pass a 2-inch length of stainless steel wire around the neck of each of these teeth. Using a hemostat, twist the ends of each of these wires together. Cut the twisted wire one-half inch from the tooth it encircles and bend it back to form a tight loop. Bend the loop back toward the gingiva so that it forms a hook. Anchor small elastic bands between the curved loops of the maxillary and mandibular teeth so that their forces bring the jaws together.

229 - 1. F.
229 - 2. F.
229 - 3. T.
229 - 4. T.

230 - 1. After an extraction if a normal blood clot fails to form or is dislodged.
230 - 2. After the third day.
230 - 3. That a portion of the alveolar bone is exposed and infected. The socket usually has a foul odor, and the surrounding tissue is inflamed.
230 - 4. Irrigating the pocket with warm saline and packing the pocket with iodoform gauze saturated in eugenol. Sedatives and/or analgesics may be prescribed to relieve pain and possible insomnia.

231 - 1. g.
231 - 2. a.
231 - 3. d.
231 - 4. e.
231 - 5. j.
231 - 6. b.
231 - 7. f.
231 - 8. c.
231 - 9. i.
231 - 10. h.
231 - 11. l.
231 - 12. k.

232 - 1. F.
232 - 2. T.
232 - 3. T.
232 - 4. T.
232 - 5. F.
232 - 6. T.
232 - 7. T.
232 - 8. F.
232 - 9. F.
232 - 10. T.
232 - 11. T.
232 - 12. T.
232 - 13. F.
232 - 14. T.

233 - 1. a.
233 - 2. b.
233 - 3. c.
233 - 4. e.
233 - 5. h.
233 - 6. a.
233 - 7. b.
233 - 8. d.
233 - 9. e.
233 - 10. f.
233 - 11. g.

234 - 1. T.
234 - 2. F.
234 - 3. F.
234 - 4. T.
234 - 5. F.
234 - 6. T.

235 - 1. Resorption is the dissolution of tissues by body fluids or cellular activity.
235 - 2. The resorption of the root of deciduous teeth so that their crown may be shed to make room for the permanent teeth.
235 - 3. Trauma; orthodontic appliances used to move teeth too rapidly; attempted eruption of retained or impeded teeth, improperly designed prosthesis, or infection.

CHAPTER 3

Reference:
236 - 1. Topical, oral, inhalation, and injection.
236 - 2. Topical.
236 - 3. Because it is painless, requires no special apparatus, and produces a systemic effect in a short period of time.

236 - 4. f.
236 - 5. d.
236 - 6. b.
236 - 7. a.
236 - 8. c.
236 - 9. e.
236 - 10. g.
236 - 11. Inhalation.
236 - 12. Normal saline.
236 - 13. Because in this method a pool of medicament is deposited in the muscle and is then slowly absorbed into the tissues.
236 - 14. This delays absorption and further prolongs the drug's action.
236 - 15. Injecting into a blood vessel would result in a more rapid absorption of the medicament than desired or intended. This could be dangerous, since the rapid absorption would place too much of the drug in the patient's system at one time.
236 - 16. Intravenous.
236 - 17. The effect desired; the rapidity of action needed; the nature and amount of the drug to be given; and the physical condition of the patient.

237 - 1. The local action is the effect that a drug or medication produces at the point or area of application or introduction.
237 - 2. This is the action of a drug on some tissue or organ remote from the site of introduction. Such action occurs only after the drug has been absorbed or has entered the vascular system.
237 - 3. F.
237 - 4. F.
237 - 5. T.
237 - 6. T.

238 - 1. F.
238 - 2. T.
238 - 3. T.
238 - 4. F.
238 - 5. T.

239 - 1. Toxic reactions may be alleviated by adjusting the dosage; taking the patient off the drug; or in severe cases, administering another drug to counteract the one that is producing a toxic effect.
239 - 2. d.
239 - 3. i.
239 - 4. b.
239 - 5. g.
239 - 6. k.
239 - 7. e.
239 - 8. j.
239 - 9. a.
239 - 10. h.
239 - 11. f.
239 - 12. c.

240 - 1. T.
240 - 2. F.
240 - 3. F.
240 - 4. F.
240 - 5. T.

241 - 1. Analgesics are drugs which relieve pain without acting to depress consciousness.
241 - 2. Narcotic analgesics.
241 - 3. Morphine.
241 - 4. It is habit-forming, depresses breathing, and contracts the pupils of the eyes.
241 - 5. It is less habit-forming.
241 - 6. Meperidine.
241 - 7. Non-narcotic analgesics.
241 - 8. Salicylates.
241 - 9. They reduce fever.
241 - 10. Salicylism.
241 - 11. Ulcer.
241 - 12. In the treatment of musculoskeletal conditions and when the patient is allergic to aspirin.
241 - 13. Propoxyphene hydrochloride (Darvon).

242 - 1. Relax; produce.
242 - 2. Hypnotic.
242 - 3. Sedatives.
242 - 4. Hypnotic.
242 - 5. Barbiturates.
242 - 6. Mild sedation; coma.
242 - 7. Duration.
242 - 8. Speed; onset.
242 - 9. Shock; respiratory depression.
242 - 10. Alcohol; tranquilizers; antihistamines; narcotic analgesics.

243 - 1. T.
243 - 2. T.
243 - 3. a. T.
b. F.
c. T.
d. F.
e. F.
f. T.
243 - 4. F.
243 - 5. T.
243 - 6. F.
243 - 7. F.
243 - 8. F.
243 - 9. T.
243 - 10. F.
243 - 11. F.
243 - 12. T.
243 - 13. T.
243 - 14. T.

244 - 1. To stop the hemorrhage of blood.
244 - 2. Gelatin sponge, oxidized cellulose, and oxidized regenerated cellulose.
244 - 3. Their method of manufacture.
244 - 4. To pack sockets and as a sutured implant in soft tissues.
244 - 5. When there is a history of blood coagulation problems.

245 - 1. T.
245 - 2. T.
245 - 3. T.
245 - 4. T.
245 - 5. F.
245 - 6. F.
245 - 7. F.

246 - 1. Constrict; capillaries.
246 - 2. Epinephrine; hemostatic.
246 - 3. Longer.

247 - 1. Antisialagogues reduce the excessive flow of saliva.
247 - 2. They cause dryness of the throat and speech difficulty.
247 - 3. Atropine sulfate and scopolamine.

248 - 1. F.
248 - 2. F.
248 - 3. T.
248 - 4. T.
248 - 5. T.

249 - 1. Allergic.
249 - 2. Benadryl.

249 - 3. Side.

250 - 1. Through the water supply.
250 - 2. Fluorosis.
250 - 3. The average daily water intake in warm climates is greater.
250 - 4. 0.6 to 1.7 ppm.
250 - 5. Giving dietary supplements of fluoride tablets.
250 - 6. Contact the surface of the erupted tooth with a 10-percent stannous fluoride aqueous solution for 30 seconds; repeat at 6- to 12-month intervals.
250 - 7. AFR 161-9, *Fluoridation and Defluoridation of Water Supplies.*

251 - 1. Peroxide.
251 - 2. 30.
251 - 3. 3; cleansing.

252 - 1. Cleansing purposes; to aid in rendering treatment.
252 - 2. Orange oil, ethyl alcohol, and isopropyl alcohol.
252 - 3. Chloroform and eucalyptol.

253 - 1. a. As a densitizing paste when mixed with camphor.
  b. As a pulp-capping material when mixed with zinc oxide.
253 - 2. To sterilize root canals.
253 - 3. To sterilize root canals.
253 - 4. A 50-percent solution of alcohol.

254 - 1. T.
254 - 2. T.
254 - 3. F.
254 - 4. F.
254 - 5. F.

255 - 1. Bristles—soft to medium; flat brushing surface formed by multiple tufts; head size—small to medium.
255 - 2. Type of treatment, dental condition, size of mouth, patient's manipulative ability.
255 - 3. It can prevent him from injuring his gingival tissues.
255 - 4. He will need a regular mirror and a mouth mirror to insure that the inside surfaces are clean.
255 - 5. Irrigators.
255 - 6. No. Brushing the teeth normally gives the necessary massaging.

CHAPTER 4

Reference:
256 - 1. Bacteria, viruses, rickettsiae, protozoa, and fungi.
256 - 2. The shape of the bacteria, the way the cells are arranged or grouped together, and their reaction to the gram stain.
256 - 3. a. Cocci.
  b. Bacillus.
  c. Spirochetes or spirilla.
256 - 4. Diplococci.
256 - 5. Streptococci.
256 - 6. Binary fission.
256 - 7. A capsule.
256 - 8. It is a hairlike appendage that whips back and forth to create the movement of some bacteria.
256 - 9. A spore.
256 - 10. The proper environment to survive.
256 - 11. A group of ultramicroscopic, disease-causing agents.
256 - 12. Viruses.
256 - 13. By insects such as fleas, lice, mites, or ticks.
256 - 14. Rocky Mountain spotted fever and typhus.
256 - 15. Protozoa.
256 - 16. Protozoa.
256 - 17. The fungi.
256 - 18. Superficial infections that grow on the skin and more serious infections, where the fungus invades the lungs and other tissues of the body.
256 - 19. Because they lack chlorophyll, and therefore the ability to convert carbon dioxide, water, and sunlight into sugars.

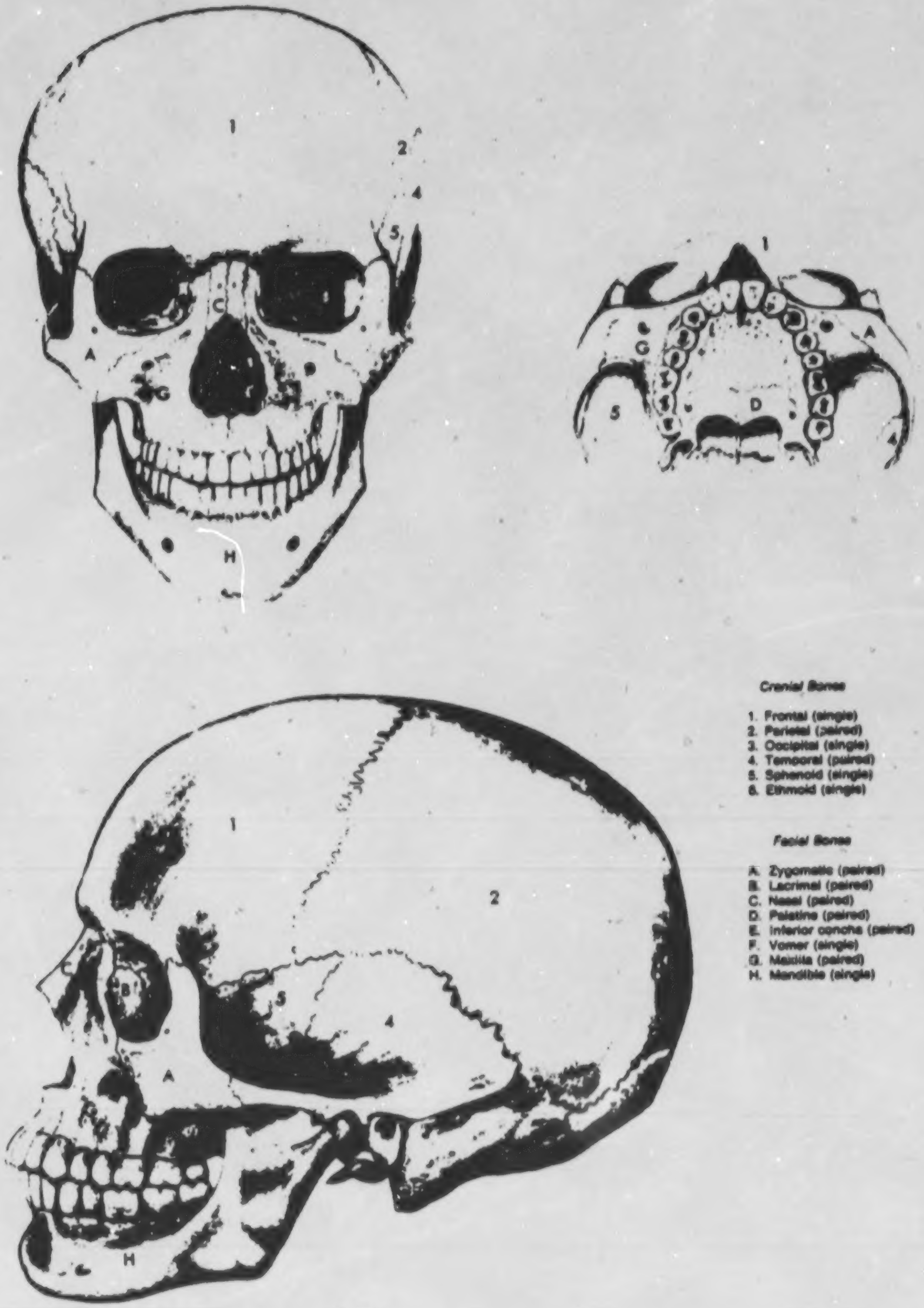
257 - 1. F.
257 - 2. T.
257 - 3. T.
257 - 4. T.
257 - 5. F.
257 - 6. F.
257 - 7. T.
257 - 8. F.
257 - 9. T.
257 - 10. F.
257 - 11. T.
257 - 12. T.
257 - 13. F.
257 - 14. F.
257 - 15. T.
257 - 16. F.
257 - 17. T.

258 - 1. F.
258 - 2. T.
258 - 3. F.
258 - 4. F.
258 - 5. F.
258 - 6. T.
258 - 7. T.

259 - 1. Clean the instruments with a scrub brush and soapy water, rinse in clean water, and dry them to prevent spotting.
259 - 2. Sterilization is the destruction of micro-organisms.
259 - 3. Its species, growth stage, and whether or not it produces spores.
259 - 4. So that the pack can be unwrapped without touching the contents.
259 - 5. The autoclave method.
259 - 6. 121° C. (250° F.) at 15 pounds pressure for 15 to 20 minutes.
259 - 7. Failure to use distilled water will cause a scale to form on the autoclave's inner surface.
259 - 8. There must be space left between the packs to allow for the circulation of steam.
259 - 9. Because condensation will wet the pack and cause contamination.
259 - 10. At least once each month.
259 - 11. Because it takes approximately four times as long as with the steam method.
259 - 12. Because the high temperature produced by the dry heat sterilizer could cause cotton, paper, plastic, or rubber items to melt, scorch, or burn.
259 - 13. Glass beads, salt, and molten metal.
259 - 14. The heat transfer sterilizer.

260 - 1. F.
260 - 2. F.
260 - 3. T.
260 - 4. F.
260 - 5. F.
260 - 6. F.

261 - 1. After they are removed from the autoclave.
261 - 2. How it is wrapped.
261 - 3. Resterilize the pack.
261 - 4. At least once a week.



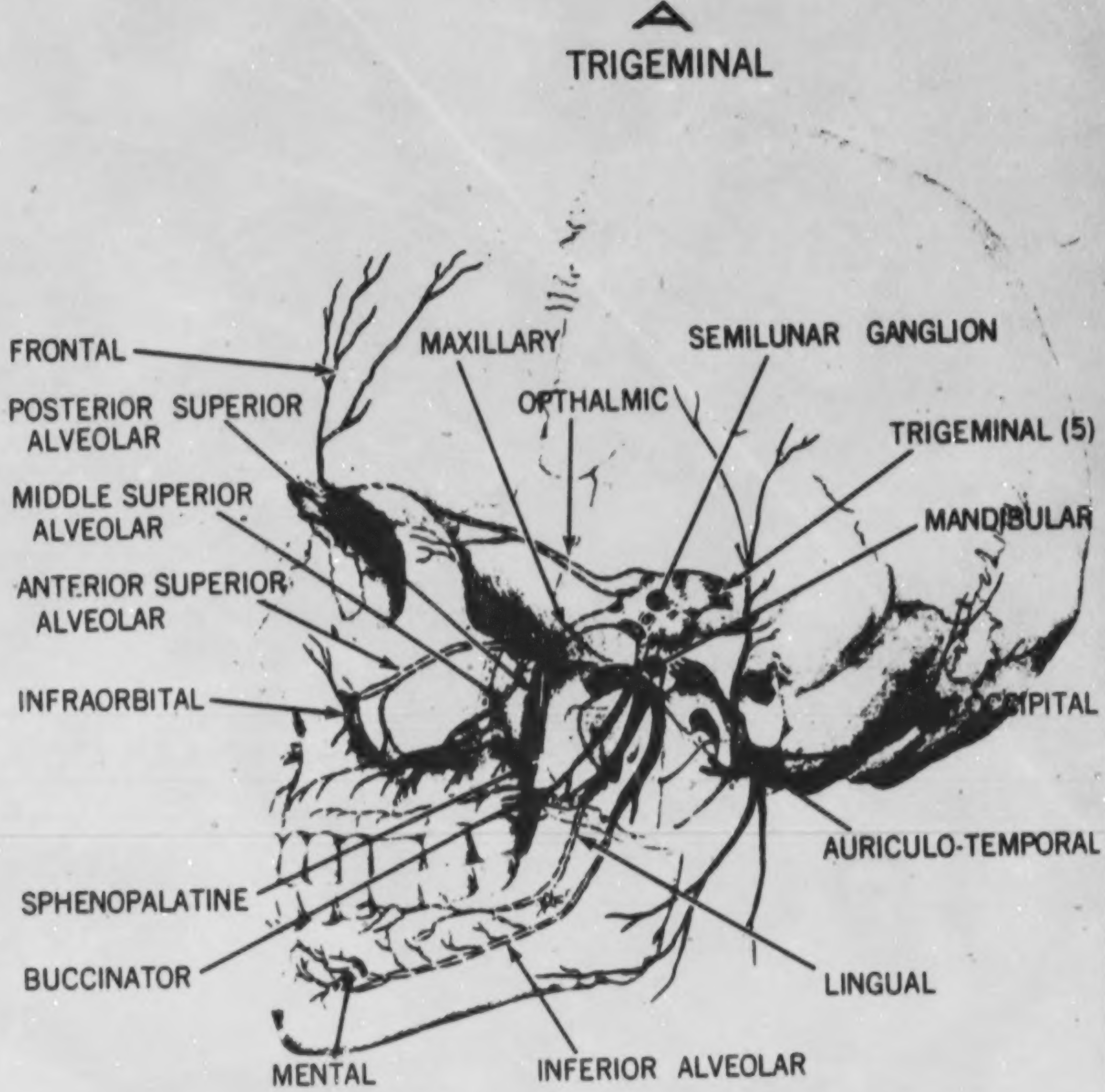
Cranial Bones

1. Frontal (single)
2. Parietal (paired)
3. Occipital (single)
4. Temporal (paired)
5. Sphenoid (single)
6. Ethmoid (single)

Facial Bones

A. Zygomatic (paired)
B. Lacrimal (paired)
C. Nasal (paired)
D. Palatine (paired)
E. Inferior concha (paired)
F. Vomer (single)
G. Maxilla (paired)
H. Mandible (single)

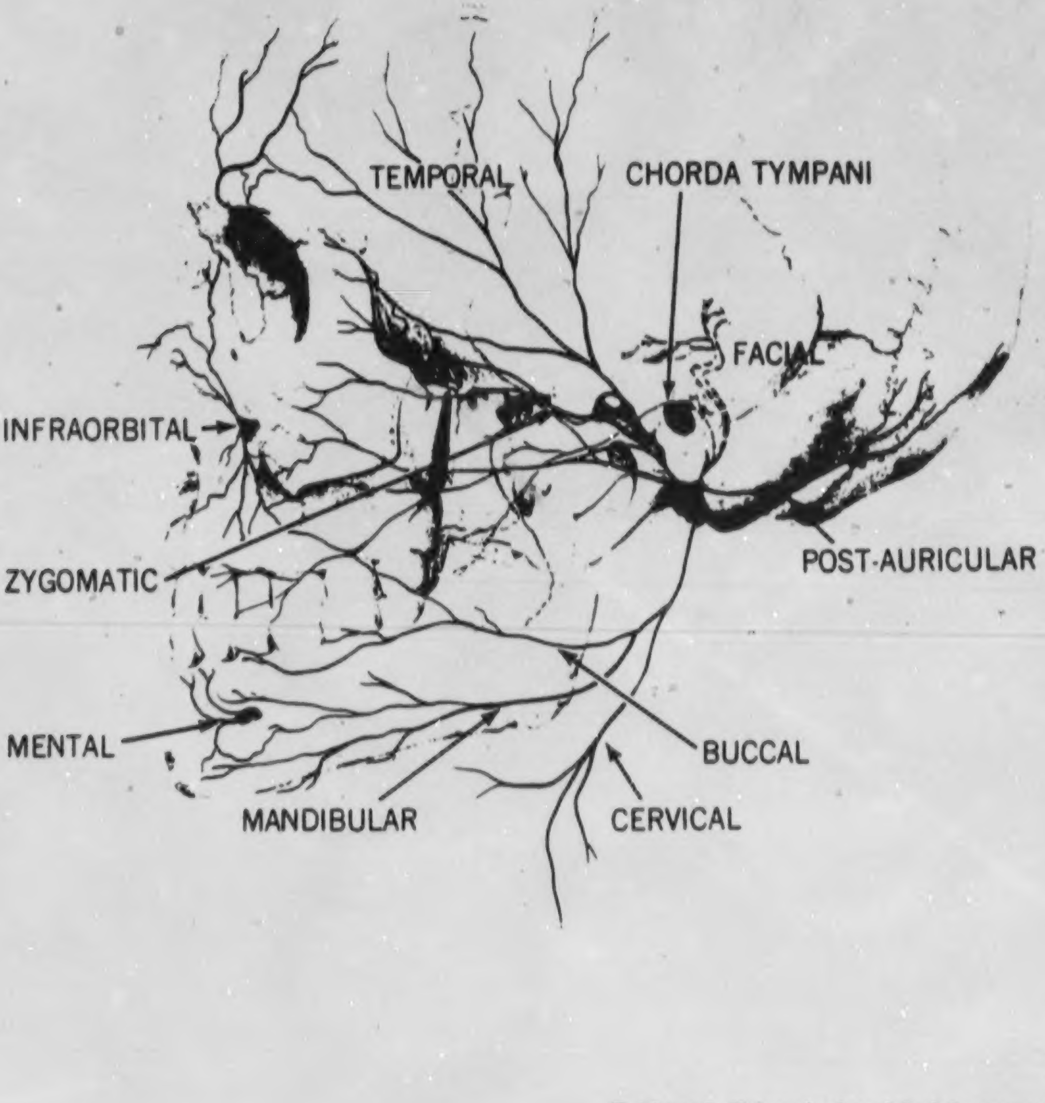
Foldout 1. Cranial and facial bones of the skull.


TRIGEMINAL
FRONTAL
POSTERIOR SUPERIOR ALVEOLAR
MIDDLE SUPERIOR ALVEOLAR
ANTERIOR SUPERIOR ALVEOLAR
INFRAORBITAL
MAXILLARY
OPTHALMIC
SEMILUNAR GANGLION
TRIGEMINAL (5)
MANDIBULAR
OCCIPITAL
AURICULO-TEMPORAL
SPHENOPALATINE
BUCCINATOR
LINGUAL
MENTAL
INFERIOR ALVEOLAR

Foldout 2. Trigeminal and facial nerves

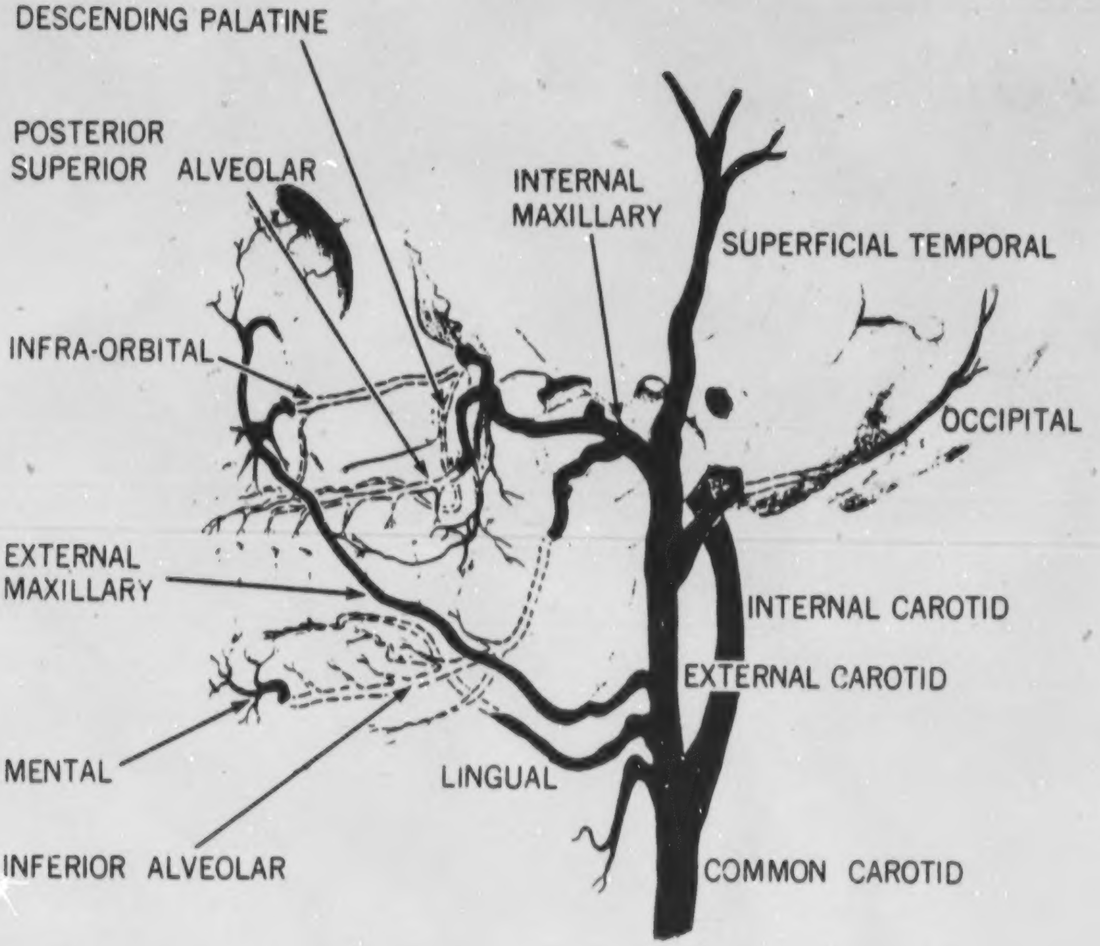
B

FACIAL


TEMPORAL
CHORDA TYMPANI
FACIAL
INFRAORBITAL
ZYGOMATIC
POST-AURICULAR
MENTAL
BUCCAL
MANDIBULAR
CERVICAL

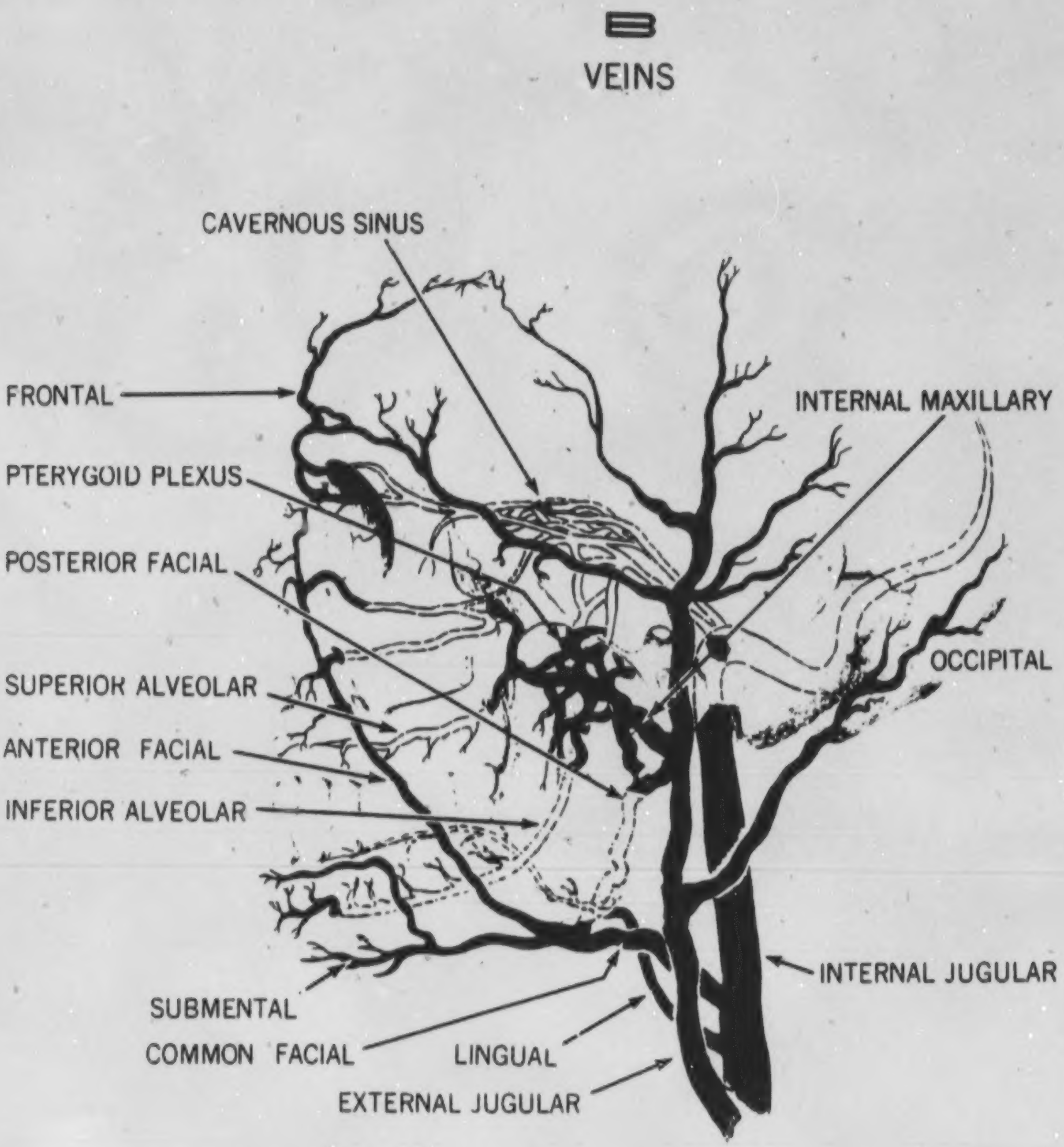
Foldout 2. Trigeminal and facial nerves.

ARTERIES

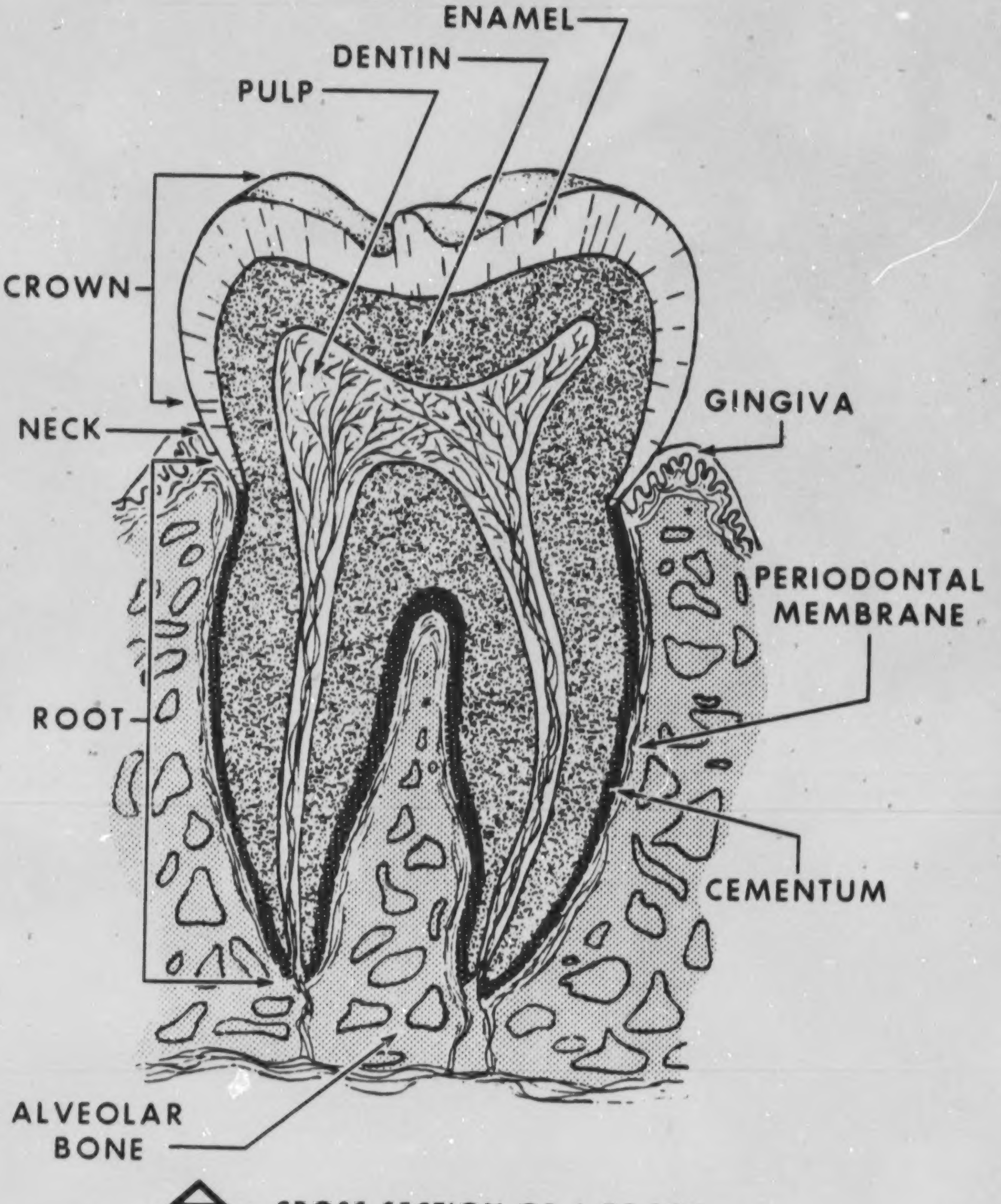

DESCENDING PALATINE
POSTERIOR SUPERIOR ALVEOLAR
INTERNAL MAXILLARY
SUPERFICIAL TEMPORAL
INFRA-ORBITAL
OCCIPITAL
EXTERNAL MAXILLARY
INTERNAL CAROTID
EXTERNAL CAROTID
MENTAL
LINGUAL
INFERIOR ALVEOLAR
COMMON CAROTID

Foldout 3. Arteries and veins of the head.

154

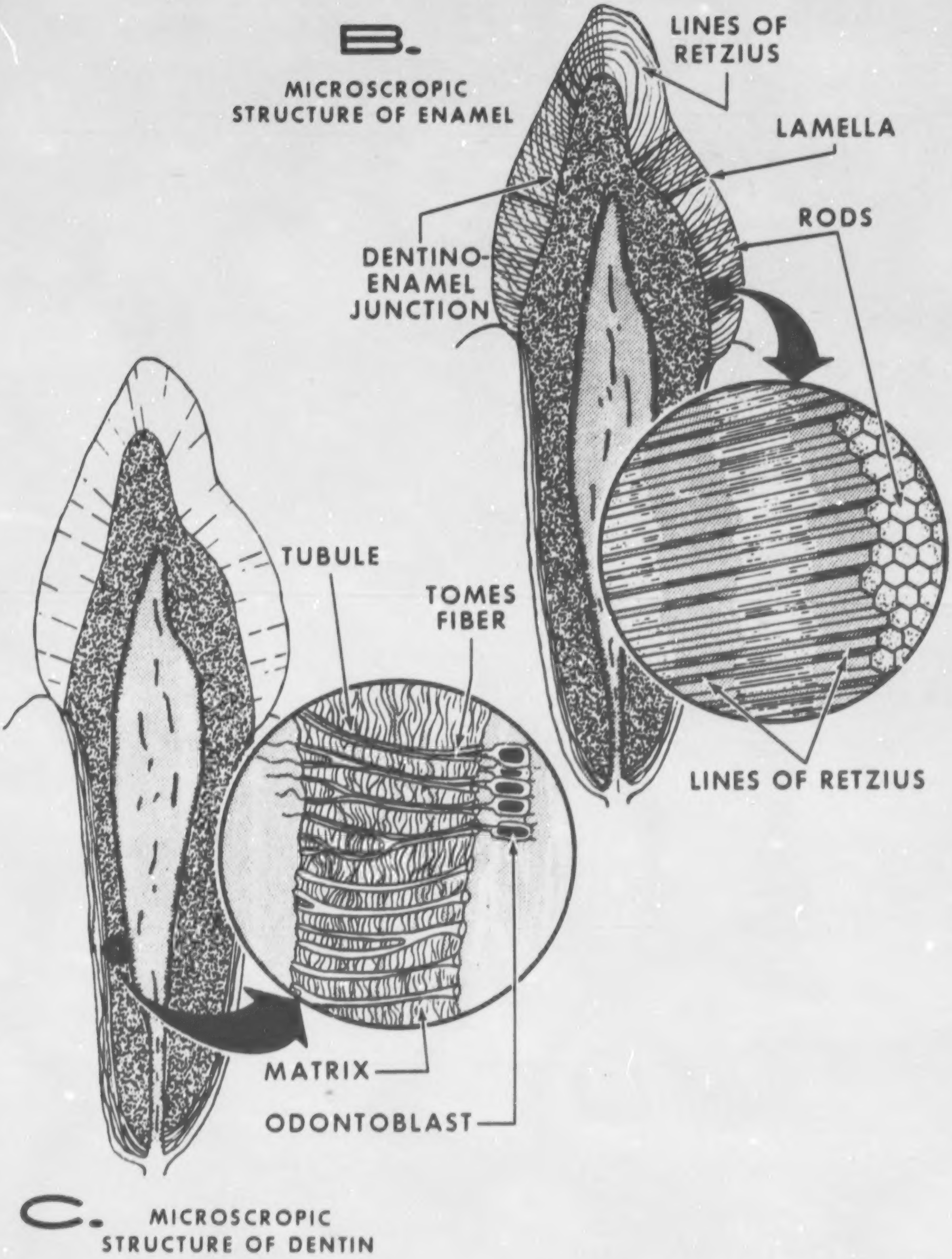

B
VEINS
CAVERNOUS SINUS
FRONTAL
INTERNAL MAXILLARY
PTERYGOID PLEXUS
POSTERIOR FACIAL
OCCIPITAL
SUPERIOR ALVEOLAR
ANTERIOR FACIAL
INFERIOR ALVEOLAR
INTERNAL JUGULAR
SUBMENTAL
COMMON FACIAL
LINGUAL
EXTERNAL JUGULAR

Foldout 3. Arteries and veins of the head.

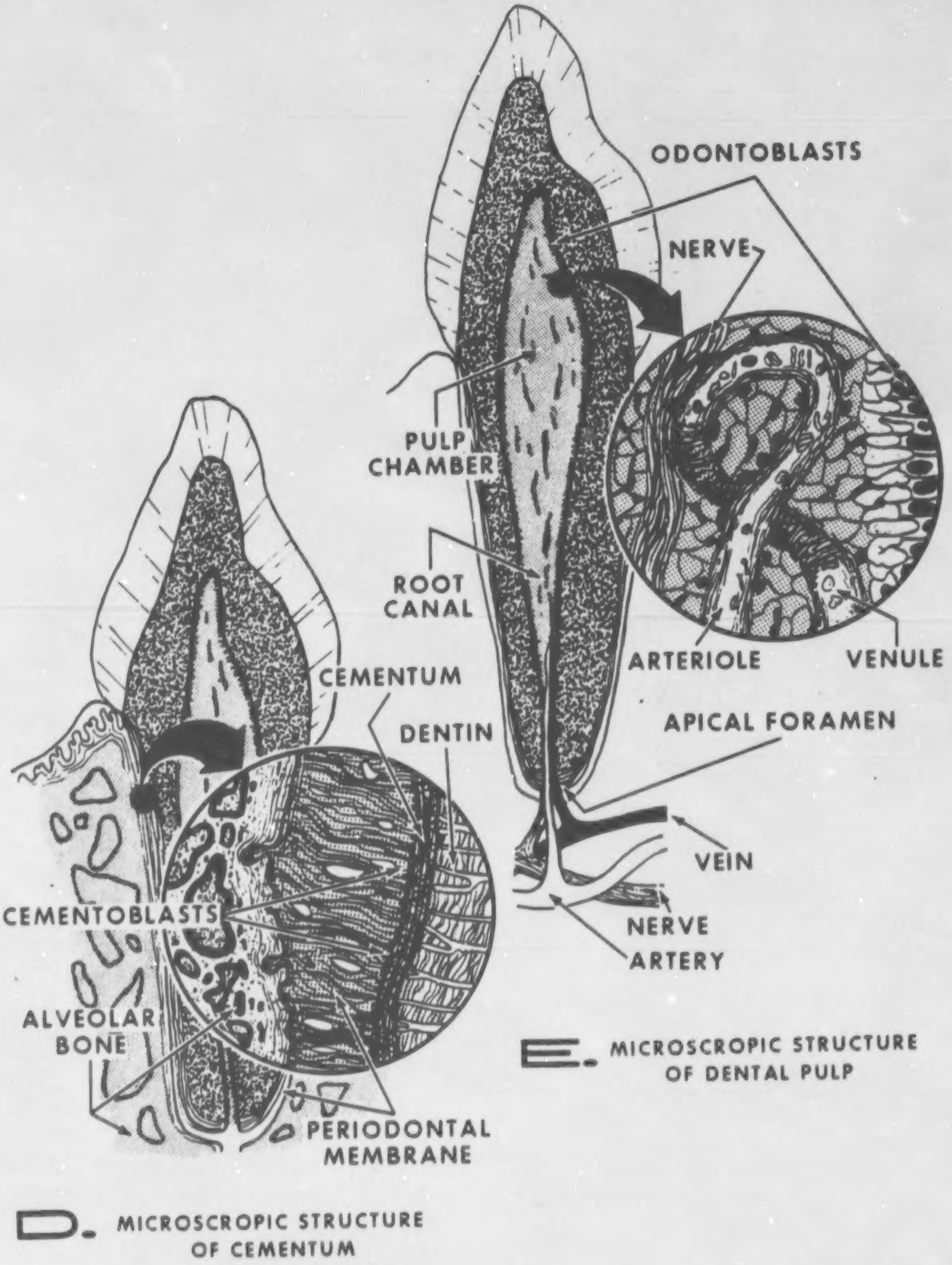

ENAMEL
DENTIN
PULP
CROWN
NECK
GINGIVA
PERIODONTAL MEMBRANE
ROOT
CEMENTUM
ALVEOLAR BONE

A. CROSS SECTION OF A TOOTH

Foldout 4. Anatomical structures of the teeth


B.
MICROSCROPIC STRUCTURE OF ENAMEL
LINES OF RETZIUS
LAMELLA
RODS
DENTINO-ENAMEL JUNCTION
LINES OF RETZIUS
TUBULE
TOMES FIBER
MATRIX
ODONTOBLAST
C. MICROSCROPIC STRUCTURE OF DENTIN

Foldout 4. Anatomical structures of the teeth


ODONTOBLASTS
NERVE
PULP CHAMBER
ROOT CANAL
ARTERIOLE
VENULE
CEMENTUM
DENTIN
APICAL FORAMEN
VEIN
NERVE
ARTERY
CEMENTOBLASTS
ALVEOLAR BONE
PERIODONTAL MEMBRANE

E- MICROSCROPIC STRUCTURE OF DENTAL PULP

D- MICROSCROPIC STRUCTURE OF CEMENTUM

Foldout 4. Anatomical structures of the teeth.

154

STOP– **1. MATCH ANSWER SHEET TO THIS EXERCISE NUMBER.** **2. USE NUMBER 1 OR NUMBER 2 PENCIL.**

98150 02 23

EXTENSION COURSE INSTITUTE
VOLUME REVIEW EXERCISE

BASIC DENTAL SCIENCES

Carefully read the following:

DO'S:

1. Check the "course," "volume," and "form" numbers from the answer sheet address tab against the "VRE answer sheet identification number" in the righthand column of the shipping list. If numbers do not match, take action to return the answer sheet and the shipping list to ECI immediately with a note of explanation.
2. Note that numerical sequence on answer sheet alternates across from column to column.
3. Use a medium sharp #1 or #2 black lead pencil for marking answer sheet.
4. Circle the correct answer in this test booklet. After you are sure of your answers, transfer them to the answer sheet. If you *have* to change an answer on the answer sheet, be sure that the erasure is complete. Use a clean eraser. But try to avoid any erasure on the answer sheet if at all possible.
5. Take action to return entire answer sheet to ECI.
6. Keep Volume Review Exercise booklet for review and reference.
7. If *mandatorily* enrolled student, process questions or comments through your unit trainer or OJT supervisor.
   If *voluntarily* enrolled student, send questions or comments to ECI on ECI Form 17.

DON'TS:

1. Don't use answer sheets other than one furnished specifically for each review exercise.
2. Don't mark on the answer sheet except to fill in marking blocks. Double marks or excessive markings which overflow marking blocks will register as errors.
3. Don't fold, spindle, staple, tape, or mutilate the answer sheet.
4. Don't use ink or any marking other than a #1 or #2 black lead pencil.

NOTE: NUMBERED LEARNING OBJECTIVE REFERENCES ARE USED ON THE VOLUME REVIEW EXERCISE. In parenthesis after each item number on the VRE is the *Learning Objective Number* where the answer to that item can be located. When answering the items on the VRE, refer to the *Learning Objectives* indicated by these *Numbers.* The VRE results will be sent to you on a postcard which will list the *actual* VRE *items you missed.* Go to the VRE booklet and locate the *Learning Objective Numbers* for the items missed. Go to the text and carefully review the areas covered by these references. Review the entire VRE again before you take the closed-book Course Examination.

10-1

Multiple Choice

1. (200) Which facial bone forms the lower and outer edges of the eye socket and the prominent portion of the cheekbone?

   a. Vomer.
   b. Zygoma.
   c. Concha.
   d. Lacrimal.

2. (200) Through which of the following facial bones do the tear ducts pass?

   a. Vomer.
   b. Zygoma.
   c. Lacrimal.
   d. Inferior conchae.

3. (201) All of the following are processes of the maxilla except the

   a. frontal process.
   b. alveolar process.
   c. zygomatic process.
   d. condyloid process.

4. (201) Into which process of the maxilla and mandible are the teeth embedded?

   a. Alveolar.
   b. Coronoid.
   c. Palatine.
   d. Condyloid.

5. (201) The anterior process located at the top of the ramus of the mandible is called the

   a. coronoid.
   b. condyloid.
   c. zygomatic.
   d. alveolar.

6. (202) Which definition of "muscle insertion" is correct?

   a. The place where the muscle articulates with another muscle.
   b. The part of the muscle that attaches to the bone to be moved.
   c. The more fixed, more central, or larger attachment of the muscle.
   d. The part of the muscle that inserts into the bone.

7. (202) Which muscle forms the floor of the mouth?

   a. Mylohyoid.
   b. Temporalis.
   c. Buccinator.
   d. Orbicularis oris.

8. (203) What is the function of the synovial membrane located in the temporomandibular joint?

   a. It helps prevent excessive movement of the mandible.
   b. It aids the ligaments in supporting the mandible.
   c. It secretes a fluid that acts as a lubricant for the joint.
   d. It provides an attachment for the muscles of mastication.

9. (204) The mouth opens anteriorly through the lips, and posteriorly through the fauces into the

   a. pharynx.
   b. trachea.
   c. intestines.
   d. larynx.

10. (204) Which type of oral mucosa is tightly bound to underlying bone, such as the hard palate and attached gingiva?

    a. Lining.
    b. Specialized.
    c. Masticatory.
    d. Epithelium.

11. (204) Which of the tongue's papillae are responsible for the taste sensation of bitterness?

    a. Foliate. c. Fungiform.
    b. Filiform. d. Circumvallate.

12. (204) Which name applies to the sickle-shaped extensions of connective tissue that connect the lips to the alveolar ridges?

    a. Labial frena. c. Foramina.
    b. Muscle. d. Papillae.

13. (204) Which anatomical structure, in combination with the muscles of the neck, closes off the passageway between the nasal cavity and the throat during swallowing?

    a. Hyoid. c. Pharynx.
    b. Uvula. d. Trachea.

14. (204) Identify the large salivary gland that lies in the cheek just in front of the ear.

    a. Parotid. c. Sublingual.
    b. Wharton's. d. Submaxillary.

15. (205) Which division of the trigeminal nerve is entirely sensory and divides into branches that supply sensation to the tissues around the eye and the adjacent parts of the nose and forehead?

    a. Maxillary. c. Mandibulary.
    b. Ophthalmic. d. Superior alveolar.

16. (205) Which branch of the fifth cranial nerve's maxillary division supplies innervation to the maxillary bicuspid teeth and the mesiofacial root of the first molar?

    a. Nasopalatine. c. Anterior superior alveolar.
    b. Greater palatine. d. Middle superior alveolar.

17. (205) Which cranial nerve supplies motor sensations to all of the muscles of facial expression and sensory sensation to the tongue?

    a. First. c. Seventh.
    b. Fifth. d. Ninth.

18. (206) Which branch of the intermaxillary artery supplies the incisors and cuspids as well as the maxillary bone?

    a. Infraorbital. c. Inferior alveolar.
    b. Descending palatine. d. Posterior superior alveolar.

19. (206) Into which vein does the common facial vein empty?

    a. Anterior facial. c. Internal jugular.
    b. Posterior facial. d. Pterygoid venous plexus.

20. (207) Lymph fluid is derived from blood plasma when it

    a. is regenerated by the heart.
    b. leaks into spaces between the tissue cells.
    c. becomes overabundant in carbon dioxide.
    d. is manufactured by the many circulating lymphocytes.

21. (207) All of the following are functions of the lymph system except to

    a. transport disease-producing organisms to the lymph nodes.
    b. carry off excessive fluids from the body.
    c. serve as an auxiliary nerve supply.
    d. act as a supplement to the venous system.

22. (208) How many teeth are normally present in the deciduous dentition?

    a. 20.
    b. 24.
    c. 28.
    d. 32.

23. (208) Which term refers to the working surface of posterior teeth?

    a. Mesial.
    b. Distal.
    c. Incisal.
    d. Occlusal.

24. (209) In a full set of permanent dentition, there are

    a. 12 molars.
    b. 6 bicuspids.
    c. 4 incisors.
    d. 2 cuspids.

25. (209) Which of the following statements concerning the incisor teeth is correct?

    a. Incisors function to grind food into small portions.
    b. Mandibular central incisors are significantly larger than the lateral incisors.
    c. Maxillary central incisors are smaller than the lateral incisors.
    d. Incisors are important for correct enunciation of certain speech sounds.

26. (209) Compared to permanent teeth, deciduous teeth have

    a. less constriction at their neck.
    b. stronger and smoother textured enamel.
    c. whiter and more uniformly colored enamel.
    d. a smaller pulp chamber.

27. (210) What is the name of the narrow portion of the tooth where the crown and root meet?

    a. Apex.
    b. Cervix.
    c. Occlusal.
    d. Contact point.

28. (210) What is the hardest calcified tissue in the human body?

    a. Bone.
    b. Dentin.
    c. Enamel.
    d. Cementum.

29. (210) What is the name of the specialized cells that produce dentin?

    a. Odontoblasts.
    b. Ameloblasts.
    c. Odontoclasts.
    d. Ameloclasts.

30. (210) What is the primary function of the tooth's pulp?

    a. Transmitting stimuli.
    b. Producing dentin.
    c. Nourishing the apical fibers.
    d. Combating bacteria.

31. (211) Which periodontal fiber group connects the cementum of adjacent teeth by running from one tooth over the alveolar crest to the adjacent teeth?

a. Gingival.
b. Transeptal.
c. Horizontal.
d. Alveolar crest.

32. (211) The V-shaped space reaching from the free gingival margin to the depth where the gingiva attaches to the tooth is called the

a. gingival sulcus.
b. contact area.
c. periodontal relief.
d. interproximal space.

33. (212) What is the most common of all dental diseases?

a. Gingivitis.
b. Pulpitis.
c. Pericoronitis.
d. Dental caries.

34. (212) All of the following contribute to the process of dental caries *except*

a. a diet high in carbohydrates.
b. a diet high in refined sugars.
c. a diet high in calcium.
d. neglect or lack of oral hygiene.

35. (212) Which bacteria are associated with the acidogenic theory of tooth decay?

a. Sarcinae and neisseria.
b. Spirochetes and bacilli.
c. Streptococci and *Treponema pallidum*.
d. *Lactobacillus acidophilus* and streptococci.

36. (212) In both the acidogenic and proteolytic theories, what is the supplier of the bacteria needed to cause dental caries?

a. Plaque.
b. Enzymes.
c. Carbohydrates.
d. Food debris.

37. (212) Generally the *first* symptom of tooth decay is

a. pain from foods and liquids containing high concentrations of sugar.
b. the spontaneous production of secondary dentin.
c. the inflammation of the pulpal tissues.
d. sensitivity to cold foods and liquids.

38. (213) What is the most common cause of secondary pulpitis?

a. Trauma.
b. Systemic disease.
c. Thermal change.
d. Extensive tooth decay.

39. (213) In the condition of acute pulpitis, the pain may be somewhat relieved by

a. applying heat.
b. cold applications.
c. lying down in bed.
d. putting pressure on the tooth.

40. (214) In comparison with an acute periapical abscess, a chronic periapical abscess

a. is less painful.
b. is of much shorter duration.
c. has greater tendency to spread.
d. does not cause pain when pressure is placed on the tooth.

41. (214) Which of the following conditions is characterized by high fever (104° F. to 105° F.), rapid pulse, headaches, and trismus of the involved masticatory muscles?

a. Cellulitis.
b. Periodontitis.
c. Periodontal abscess.
d. Acute periapical abscess.

42. (215) In which of the following locations does pericoronitis occur most frequently?

a. On the hard palate.
b. In the area of the labial frenum.
c. Around the crowns of partially erupted teeth.
d. In the maxillary incisor and cuspid area.

43. (215) In some cases of pericoronitis, the dentist may have to surgically excise and remove the involved

a. operculum.
b. tooth crown.
c. retromolar pad.
d. labial frenum.

44. (216) Why is a thorough curettage of the area where a cyst has been removed important to the success of the procedure?

a. Curettage stimulates the tissue to regenerate.
b. Curettage removes bacteria that could lead to an abscess.
c. Curettage eliminates rest cells that could lead to the cyst's reoccurrence
d. Curettage delays the reformation of tissue and causes the wound to heal from the inside out.

45. (217) A dental granuloma is considered to be

a. an acute infection.
b. a chronic infection.
c. an acute inflammation.
d. a chronic inflammation.

46. (218) Which type of gingivitis is characterized by swollen, red, and bleeding gingiva, covered with a grey-white false membrane, fetid odor, fever, painful gums, swollen cervical lymph glands, and malaise?

a. Hormonal.
b. Infective.
c. Necrotizing.
d. Desquamative.

47. (218) Which type of gingivitis is characterized by an enlargement of the gingiva that is not due to swelling but to tissue growth?

a. Hyperplastic.
b. Necrotizing.
c. Hormonal.
d. Simple.

48. (219) Which disease may be described as an uncommon occurrence of a nonspecific, noninflammatory degeneration of the periodontia?

a. Gingivitis.
b. Periodontitis.
c. Periodontosis.
d. Pericoronitis.

49. (220) Which of the following terms refers to aphthous stomatitis?

a. Cold sore.
b. Canker sore.
c. Fever blister.
d. Koplik's spots.

50. (220) The treatment for both aphthous stomatitis and herpes simplex is

a. chemotherapy.
b. surgical excision.
c. surgical incision.
d. palliative in nature.

51. (221) Which disease is caused by the Treponema pallidum bacteria?

a. Syphilis.
b. Periodontosis.
c. Herpes simplex.
d. Aphthous stomatitis.

52. (221) Which stage of syphilis produces a lesion called a gumma?

a. First stage.
b. Second stage.
c. Third stage.
d. Fourth stage.

53. (222) Patients suffering from tuberculosis develop painful oral lesions that form

a. outside the lips.
b. along the lateral borders of the tongue.
c. in the area of the maxillary tuberosity.
d. on and around the zygomatic process of the maxilla.

54. (223) What is an early sign of rubeola?

a. Fever blisters.
b. Cold sores.
c. Koplik's spots.
d. Oral chancres.

55. (223) Which disease is caused by a viral infection of the parotid salivary gland?

a. Mumps.
b. Measles.
c. Herpes simplex.
d. Aphthous stomatitis.

56. (224) Why is it important to identify diabetic patients prior to their dental treatment?

a. Diabetes is a highly contagious disease that requires special sterilization techniques.
b. Diabetes impairs the body's healing ability and increases the chances of infection.
c. Diabetes affects the body's coagulation process and hemorrhage control measures must be instituted.
d. Diabetes is associated with congenital heart defects and appropriate precautions must be taken.

57. (225) Angular cheilosis is a condition that results from a diet deficient in vitamin

a. E.
b. D.
c. C.
d. B complex.

58. (225) Which agent would be administered to combat a vitamin C deficiency?

a. Penicillin.
b. Chloromycetin.
c. Ascorbic acid.
d. Paramonochlorophenol.

59. (226) Chemical burns are often self-inflicted by patients who

a. eat hot pizza.
b. drink scalding coffee.
c. gargle with commercial mouthwashes too frequently.
d. place an aspirin tablet on the tissue next to an aching tooth.

60. (227) All of the following are signs and symptoms of a maxiofacial fracture except

a. malocclusion.
b. abnormal movement.
c. lack of pain.
d. history of trauma.

61. (228) Teeth selected for intermaxillary wiring in the immobilization of oral fractures should

a. not be vital to mastication.
b. be the ones that may be lost to periodontal disease.
c. have opposing teeth in the opposite arch.
d. be anterior teeth whenever possible.

62. (229) Regulations prohibit transporting facial fracture patients who

a. are under sedation.
b. have fixed intermaxillary wiring.
c. could suffer from motion sickness.
d. have elastic fixation devices.

63. (230) Which condition results when a normal blood clot fails to form or is dislodged after a tooth removal?

a. Pericoronitis.
b. Periapical abscess.
c. Alveolar osteitis.
d. Dental granuloma.

64. (231) Which of the following is a common bony tumor of the mouth?

a. Canine eminence.
b. Genial tubercle.
c. Maxillary tuberosity.
d. Torus mandibularis.

65. (232) Which of the following systemic causes could result in hypoplastic disturbances?

a. Fluoride deficiency.
b. Periapical abscess.
c. Excessive salivary excretion.
d. Acute eruptive fever.

66. (232) The congenital hypoplasia that results in Hutchinson's incisor is a result of the causative organism of

a. rickets.
b. syphilis.
c. scarlet fever.
d. epidemic parotitis.

67. (233) Select the normal condition in which all the teeth show wear due to the mastication of food.

a. Abrasion.
b. Attrition.
c. Hypoplasia.
d. Erosion.

68. (234) Which tooth area is most subject to erosion?

a. The tooth's apex.
b. The occlusal surface.
c. The incisal surface.
d. The area near the cemento-enamel junction.

69. (235) The cells that are active in the resorption of bone and dentin are called

a. ameloclasts.
b. cementoblasts.
c. osteoclasts.
d. odontoblasts.

70. (236) All of the following are common methods of drug administration in the dental clinic except

a. oral.
b. rectal.
c. injection.
d. inhalation.

71. (236) Which is considered the simplest and easiest method of drug administration?

a. Oral.
b. Topical.
c. Injection.
d. Inhalation.

72. (236) What administration method is usually employed to administer aromatic ammonia?

a. Oral.
b. Topical.
c. Inhalation.
d. Injection.

73. (236) What vehicle is usually used with drugs that are to be injected?

a. Sugar.
b. Eugenol.
c. Medicinal oil.
d. Normal saline.

74. (236) Why must extreme care be taken not to inject into a blood vessel when giving an intramuscular injection?

a. Injection into a blood vessel will result in collapse of the vessel and will severely impair circulation.
b. Injection into a blood vessel will result in the drug being absorbed too rapidly, thereby putting too much of the drug in the patient's system at one time.
c. Injection into a blood vessel can result in internal tissue bleeding that could result in loss of life or limb.
d. Injection into a blood vessel delays the systemic effect of the drug since its normal absorption into the muscle does not occur.

75. (237) Systemic drug action produces a response

a. at the site of application.
b. that cannot be predetermined.
c. that always depresses the action of a gland.
d. on an organ or tissue remote from the application site.

76. (238) Which type of drug therapy uses organ or gland secretions in the treatment of deficiency diseases in human beings?

a. Replacement.
b. Stimulation.
c. Irritation.
d. Depression.

77. (239) When the side effect of a drug is, or can be, harmful, it is known as

a. an antagonistic effect.
b. a synergistic effect.
c. an untoward effect.
d. a cumulative effect.

78. (239) Which term refers to the psychological craving for the effect that a drug has on the body?

a. Addiction.
b. Habituation.
c. Tolerance.
d. Idiosyncrasy.

79. (240) The generic name of a drug is the

a. official name for the drug.
b. name that was given by the manufacturer.
c. name by which the drug must be prescribed.
d. name by which a manufacturer distinguishes his drug from like drugs of other manufacturers.

80. (241) Which drug is considered superior for the relief of deep-seated pain?

a. Aspirin.
b. Darvon.
c. Codeine.
d. Morphine.

81. (241) In addition to their pain-reducing action, most non-narcotic analgesics also function as an antipyretic. This means that they

a. kill bacteria.
b. reduce fever.
c. induce sleep.
d. prevent vomiting.

82. (241) Which of the following drugs is likely tp produce a condition known as salicylism if it is taken in frequent large doses?

a. Aspirin.
b. Codeine.
c. Penicillin.
d. Pentobarbital.

83. (242) Antihistamines should never be given in conjunction with a normal dosage of

a. barbiturates.
b. antibiotics.
c. hemostatics.
d. non-narcotic analgesics.

84. (243) Which of the following characteristics is desirable for an antibiotic substance?

a. Have predictable untoward effects.
b. Be water insoluble and stable.
c. Be able to disturb the function of any vital organ.
d. Have selective and effective antimicrobial activity against several microorganisms.

85. (243) An essential requirement for the bactericidal action of penicillin is that the bacteria must

a. have a uniform cell wall.
b. be actively multiplying.
c. be in a dormant or near dormant stage.
d. be comprised of cells having a double nucleus.

86. (243) What is usually the antibiotic of choice for patients having a known allergy to penicillin?

a. Streptomycin.
b. Tetracycline.
c. Erythromycin.
d. Chloromycetin.

87. (244) What is the function of hemostatics?

a. To relieve tension.
b. To reduce pain.
c. To kill bacteria.
d. To stop bleeding.

88. (244) Which of the following vitamins is most closely associated with the coagulation process?

a. K.
b. D.
c. C.
d. A.

89. (245) What type of injection would a dentist give if he only wanted to anesthetize a small area of tissue and a minimal number of teeth?

a. Topical.
b. General.
c. Regional block.
d. Regional infiltration.

90. (246) What is the purpose of including epinephrine in dental anesthetic solutions?

a. It speeds the onset of the anesthetic.
b. It prevents the possibility of allergic reactions.
c. It prolongs the effect of the anesthesia.
d. It eliminates all bleeding during the procedure.

91. (247) Why would an antisialagogue be administered to a dental patient?

a. To prevent bleeding.
b. To reduce the flow of saliva.
c. To disinfect tissue at the operative site.
d. To combat an allergic reaction to the anesthetic solution.

92. (248) What name applies to an agent that functions to destroy microorganisms?

a. Germicide.
b. Antiseptic.
c. Analgesic.
d. Antisialagogue.

93. (249) What purpose do antihistamines serve?

a. They relieve postoperative pain.
b. They stimulate the production of secondary dentin.
c. They combat the body's allergic reaction to certain agents.
d. They speed the onset of other dental drugs.

94. (250) The fluoride content of drinking water in southern states as compared to that in northern states should be

a. the same.
b. slightly higher.
c. significantly higher.
d. somewhat lower.

95. (251) What concentration of hydrogen peroxide is used to bleach teeth?

a. 3 percent.
b. 10 percent.
c. 15 percent.
d. 30 percent.

96. (252) What solvent is effective for partially dissolving and softening gutta-percha points before they are inserted as root canal-filling materials?

a. Chloroform.
b. Orange oil.
c. Ethyl alcohol.
d. Isopropyl alcohol.

97. (253) What solution should you keep available as a neutralizer whenever you are using phenol?

a. Water.
b. Orange oil.
c. 50-percent solution of alcohol.
d. 3-percent solution of hydrogen peroxide.

98. (254) The value realized through the use of most mouthwashes is

a. psychological.
b. highly therapeutic.
c. bactericidal in nature.
d. destruction of plaque.

99. (255) The removal of plaque from the interproximal surfaces of the teeth is best accomplished with

a. a toothbrush.
b. dental floss.
c. interdental stimulators.
d. a water-irrigating device.

100. (255) Disclosing agents are dyes that are used to stain

a. contrasting areas.
b. infected gingiva.
c. incipient caries.
d. bacterial plaques.

101. (256) The spherical-shaped bacteria are called

a. cocci.
b. bacilli.
c. spirilla.
d. spirochetes.

102. (256) The hairlike appendages that whip back and forth to provide for the movement of some microorganisms are called

a. tails.
b. filaments.
c. flagella.
d. spirochetes.

103. (256) What is the dormant form that enables some microorganisms to survive adverse conditions that would normally cause their destruction?

a. Diplo.
b. Spore.
c. Flagellum.
d. Polymorphic.

104. (256) Which listed disease is an example of a virus-caused disease?

a. Measles.
b. Typhus.
c. Ringworm.
d. Rocky Mountain spotted fever.

105. (256) Which microorganisms are primarily parasites of insects and are transmitted to man by fleas, lice, mites, or ticks?

a. Viruses.
b. Protozoa.
c. Bacteria.
d. Rickettsiae.

106. (257) Which bacteria derive their nourishment from dead or decaying matter?

a. Fungi.
b. Parasites.
c. Pathogens.
d. Saprophytes.

107. (257) Bacteria that are classified as virulent pathogens are those that

a. do not damage their host's tissue.
b. derive their nourishment from dead or decaying matter.
c. cause infection so severe that the host is permanently damaged.
d. live on the host but do not cause serious damage.

108. (257) Which of the following bacteria grow only in the absence of oxygen?

a. Aerobic.
b. Anaerobic.
c. Pathogenic.
d. Facultative.

109. (257) Bacteria that retain a pinkish-red color at the completion of a gram-staining process are called

a. mordant.
b. facultative.
c. gram-negative.
d. gram-positive.

110. (257) Which of the following coccal forms of bacteria are implicated in the process of dental caries?

a. Streptococci.
b. Staphylococci.
c. Veillonella.
d. Neisseria.

111. (257) Which of the following bacteria appear in large numbers when necrotizing ulcerative gingivitis is present?

a. Spirilla.
b. Streptococci.
c. Staphylococci.
d. Fusiform bacilli.

112. (257) Which of the following, when viewed with a phase microscope, appear as comma-shaped bacteria that are extremely mobile?

a. Vibrios.
b. Leptothrix.
c. Streptococci.
d. Veillonella.

113. (257) Which bacteria are predominant in an edentulous mouth?

a. Facultative coccal forms.
b. Aerobic filamentous forms.
c. Aerobic cocci and short-rod forms.
d. Anaerobic cocci and filamentous forms.

114. (258) The cutting edge of a properly sharpened dental instrument will

a. show as a surface when viewed through a magnifying glass.
b. not reflect light.
c. not cut a fingernail.
d. retain its sharpness when disinfected in boiling water.

115. (258) What action should you take if the surface of your Arkansas stone becomes glazed?

a. Discard the stone and order a new one.
b. Soak the stone in an ammonia-water solution.
c. Place the stone in the autoclave and run it through a sterilizing cycle.
d. Run a mandrel-mounted sharpening stone over the surface until the glaze is removed.

116. (258) Which of the following instruments should you sharpen with a mandrel-mounted sharpening stone?

a. Chisel.
b. Curette.
c. Hatchet.
d. Spoon excavator.

117. (259) Which of the following autoclaving cycles would normally suffice for the sterilization of dental instruments?

a. 10 pounds pressure at 200° F. for 10 minutes.
b. 15 pounds pressure at 200° F. for 10 minutes.
c. 15 pounds pressure at 225° F. for 15 minutes.
d. 15 pounds pressure at 250° F. for 20 minutes.

118. (259) Which of the following actions should you take to remove heavy scale deposit from the inside of an autoclave?

a. Wash with soap and a soft brush.
b. Scour the inner surfaces with steel wool and pumice.
c. Add 1/2-cup vinegar to the water and run the autoclave through a sterilizing cycle.
d. Replace the autoclave's water with a solution of ammonia and hydrogen peroxide and run the autoclave through a sterilizing cycle.

119. (259) Bacterial spore strips should be employed to verify the effectiveness of the autoclave at least

a. weekly.
b. monthly.
c. quarterly.
d. annually.

120. (259) Sterilization in the dry heat sterilizer requires the exposure of instruments to a temperature of 350° F. for a period of

a. 10 minutes.
b. 20 minutes.
c. 30 minutes.
d. 60 minutes.

121. (260) When you disinfect an instrument with boiling water, how long must you expose the instrument to continuous boiling?

a. 5 minutes.
b. 10 minutes.
c. 20 minutes.
d. 30 minutes.

122. (260) What is the ideal concentration of alcohol for use as a disinfectant?

a. 50 percent.
b. 70 percent.
c. 90 percent.
d. 100 percent.

123. (261) How and when should you date a sterilization pack?

a. Place the date you will sterilize the pack on the outside wrapper prior to sterilization.
b. Place the date you sterilized the pack on the outside wrapper after the pack is sterilized.
c. Place the date that the pack will no longer be considered sterile on the outside wrapper prior to sterilization.
d. Place the date that the pack will no longer be considered sterile on the outside wrapper after the pack is sterilized.

124. (261) You should disinfect the trays of the dental instrument cabinet at least

a. daily.
b. weekly.
c. monthly.
d. quarterly.

98150 03 7501

CDC-98150

DENTAL SPECIALIST

(AFSC 98150)

Volume 3

Dental Instruments and Materials

Extension Course Institute 10-1

Air University 181

174

Preface

THIS THIRD VOLUME of your Career Development Course (CDC) is designed to provide you with a knowledge of the materials and instruments employed in the practice of modern dentistry. The first three chapters of this volume are concerned with dental instruments. Each chapter has been carefully planned to cover a particular segment of the many instruments available through Air Force supply channels. In the first chapter are what are termed the "general" dental instruments, the instruments that are commonly used in more than one section of the dental service. To be specific, these are the diagnostic and rotary instrument groups, plus some miscellaneous instruments that are common to many sections. Chapter 2 concentrates on the restorative instrument group. These are the instruments that are used in preparing carious teeth to receive restorations and in manipulating, placing, and finishing the restorations. As you study the instruments in Chapters 2 and 3, remember that many of the instruments discussed in Chapter 1 are used in conjunction with these instruments. The third chapter focuses attention on the specialty instruments, the instruments used in oral surgery and in the periodontic, endodontic, and prosthodontic sections. Much time, effort, and expense have been expended to provide several foldouts that illustrate the whole realm of dental instruments. These foldouts present one of the most comprehensive coverages of dental instruments ever published (printed in a supplementary volume). Make it a routine practice to study these illustrations as you read the text that concerns them. The last chapter is devoted to the many materials used throughout various sections of the dental service.

For the most part, this volume reviews the related material you studied in your 3-level training. This review should reinforce your knowledge of instruments and materials and help you make a smooth transition from one patient treatment specialty to another. Further, it should better prepare you for your promotion (SKT) testing.

If you have questions on the accuracy or currency of the subject matter of this text, or recommendations for its improvement, send them to School of Health Care Sciences/MSTW, Sheppard AFB TX 76311.

If you have questions on course enrollment or administration, or on any of ECI's instructional aids (Your Key to Career Development, Behavioral Objective Exercises, Volume Review Exercise, and Course Examination), consult your education officer, training officer, or NCO, as appropriate. If he can't answer your questions, send them to ECI, Gunter AFS AL 36118, preferably on ECI Form 17, Student Request for Assistance.

This volume is valued at 30 hours (10 points).

Material in this volume is technically accurate, adequate, and current as of October 1974.

Contents

Chapter		Page
	Preface	iii
1	General Dental Instruments	1
2	Restorative Instruments	10
3	Specialty Instruments	17
4	Dental Materials	33
	Answers for Exercises	57

CHAPTER 1

NOTE: In this volume, the subject matter is developed by a series of Learning Objectives. Each of these carries a 3-digit number and is in boldface type. Each sets a learning goal for you. The text that follows the objective gives you the information you need to reach that goal. The exercises following the information give you a check on your achievement. When you complete them, see if your answers match those in the back of this volume. If your response to an exercise is incorrect, review the objective and its text.

General Dental Instruments

TEAMWORK IS THE key in the Air Force Dental Health Service. None of your duties is more important than carrying your share of the team load. The dentist relies upon you, as his assistant, to aid him in many ways. One of these ways is in the proper handling of dental instruments. You must have a sound knowledge of the great variety of these instruments and be able to anticipate the needs of the dentist. Dentists vary in the techniques they use for a given dental procedure. They may use different instruments, and you must have the right instrument ready at the right time. In this chapter, you will begin to learn the instruments that are used for the treatment of dental conditions.

1-1. Classification of Instruments

When you consider the large number of instruments needed to treat various dental conditions, it is apparent that there must be a way to distinguish one instrument from another. Instruments are classified or identified by a combination of several factors.

400. Name the parts of specific dental hand instruments and state how the instruments are identified.

Instrument Parts. There are three main parts of a dental hand instrument: the handle, the shank, and the working end. The handle is the part held in the operator's hand. Some instruments, such as mouth mirrors and Morse scalers, have detachable handles. This allows you to replace the shank and the working end without purchasing a new handle. The shank is the tapered connection between the handle and the working end. The working end, of course, is the part designed to perform a certain operation. It can be either a blade or a nib. The blade is the cutting end of cutting instruments, whereas the nib is the working part of condensing instruments. Figure 1-1 illustrates the parts of dental hand instruments.

Classification Names. The name of the dental hand instrument is derived from its association with one, or a combination, of the following classification factors:

- The purpose of the instrument—excavating, scaling, and condensing.
- The position or manner of use—hand condenser, automatic mallet, and push scaler.
- The shape of the working end—file, chisel, spoon, and hatchet.
- The angle of the working end in relation to the handle—biangle.

An example of a combination of the above classification factors is the biangle chisel.

Instrument Numbers. In addition to the classification names, instruments are also numbered. Normally, there are two different numbers on the handle of most dental hand instruments. One is an identification number; the other is a formula number. Also, the instruments may carry an abbreviation (Bl, Wds, Hol). These abbreviations are references to the instrument's designer (Black, Woodson, Hollenbeck.) These references also help to identify the instrument.

Identification numbers. These numbers are normally on the portion of the handle farthest from the working end of single-ended instruments and near the center of double-ended instruments. As their name implies, they identify the instrument. For instance, there are five Black's condensers of various sizes and shapes. The identification number makes it possible to distinguish one from another when the dentist requests an instrument or when you are ordering one from supply.

Formula numbers. Formula numbers fully describe the instrument, and because of their

.177

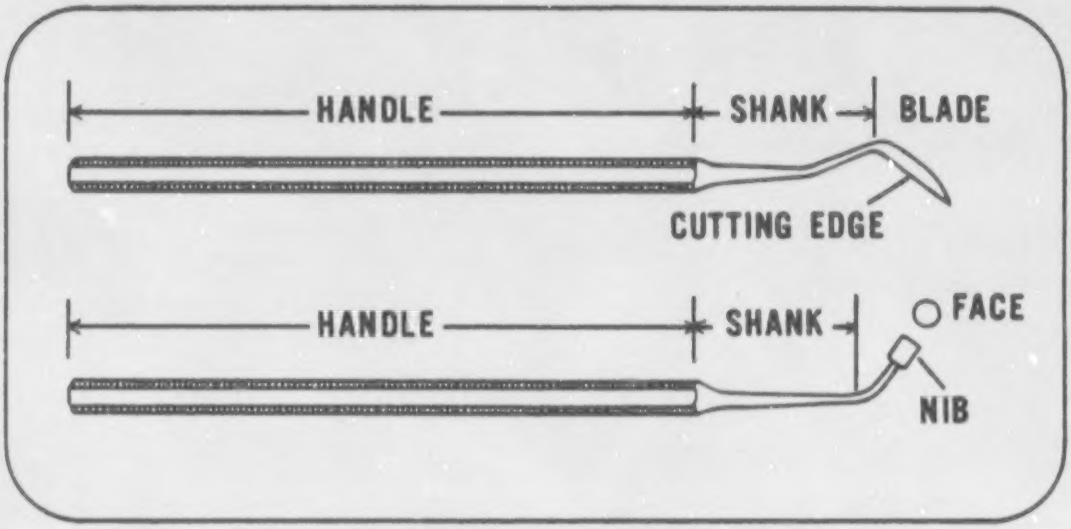


Figure 1-1. Parts of dental hand instruments.

length, are not primarily used for identification purposes. The formula number is a group of numbers, which is normally located on the handle, near the working end, of most dental hand instruments. They describe the width, length, angle, and sometimes the angle of curvature of the instrument's blade.

Exercises (400):

1. Name the three main parts of a dental hand instrument.

2. What name applies to the working end of condensing instruments?

3. What factors are associated with an instrument's classification name?

4. Where on an instrument's handle does the identification number usually appear?

5. What numbers on the instrument's handle describe the width, length, and angle of the instrument's blade?

1-2. Diagnostic Instruments and Aids

In discussing diagnostic instruments, we should point out that they often have functions other than diagnosis. Normally the diagnostic group is a mouth mirror, an explorer, and dressing forceps. These three instruments are placed on the bracket table before almost all dental procedures. Diagnostic aids help in making or confirming the dental officer's diagnosis. Refer to foldout 1.

401. Given an illustration of diagnostic instruments and aids used in dentistry, identify each by use and name.

Mouth Mirrors. Mouth mirrors (illustrated in FO 1) are used to view hard-to-see areas in the mouth, to retract tissues, and to reflect light into dark areas of the mouth. Since mouth mirrors often become scratched and clouded, you must inspect them often and take corrective action. As we mentioned earlier, the mouth mirror has a detachable handle. Simply unscrew the shank and mirror portion and screw a new one into the handle. The Air Force stocks three types of mouth mirrors: the plane glass with a front reflective surface, the plane glass with a glass-covered reflective surface, and the magnifying mouth mirror.

(1) The mirror with the front reflective surface produces the most accurate image of the item being reflected. Handle these mirrors with extra care because the reflective surface is on top of the glass and is easily marred and scratched.

(2) The glass-covered reflective surface mirror is the most common in Air Force dental clinics. However, since the reflective surface is glass covered, the "ghost" image it produces is a disadvantage.

(3) The magnifying mirror produces an enlarged image. This mirror is used when minute detail is required in a dental treatment procedure.

Another diagnostic instrument is the explorer.

Explorers. The explorer is another dental instrument used in many dental procedures. Explorers have sharp-pointed working ends called tines. This instrument is usually considered a diagnostic instrument because it is used to detect small cavities and to check the depth of cavities. The dental officer also uses explorers to probe for foreign bodies, to determine the margin quality of fillings, and to detect fractured tooth enamel. Explorers are available in various sizes and shapes. You may find one each of several kinds or all of one kind in the dental treatment room you are assigned to maintain. Be sure to replace explorers with broken or bent tines (see FO 1). A third instrument usually placed in the diagnostic group is the dressing forceps.

Dressing Forceps. Dressing forceps are curved, tweezerlike instruments (see FO 1). They are used in many dental treatment operations. In the examination section, the dental officer uses dressing forceps to carry cotton pellets for drying teeth or cavities. Used in this way, they are diagnostic instruments. Since they are used to carry cotton pellets, they are frequently referred to as cotton pliers or cotton forceps. Dressing forceps are sometimes used to apply medicaments and dressings. You should place a pair of dressing forceps along with a mouth mirror and explorer on the bracket table for almost every dental procedure. Other items the dentist uses to make a proper diagnosis are called diagnostic aids, and include the transilluminator, vitalometer, radiograph, and clinical thermometer.

Transilluminator. The transilluminator may also be referred to as a diagnostic lamp (see FO 1). It is a small mouth lamp found in some dental operating units. By directing this light through the gingival tissues, the dentist can detect certain gingival fluids, calculus, and foreign bodies. There is also a battery-operated transilluminator which is sometimes made available when dental operating units are not equipped with one. Maintain these lamps by keeping them clean and disinfected. *Do not* try to sterilize transilluminators with any heating type of sterilization. The outer case is made of plastic and is deformed at heat sterilization temperatures. Disinfect them with a 70-percent isopropyl alcohol solution or other approved disinfecting chemical agent. Another diagnostic aid operated by electrical power is the vitalometer.

Vitalometer. The vitalometer (shown in FO1) is another device found on some dental operating units and is available as a portable kit. Some of those found on a dental operating unit operate from the same handle as the transilluminator. Other units are equipped with a handle for each diagnostic aid. The vitalometer is also known as the pulp tester, and is used to determine the vitality of pulp-nerve tissues in teeth. It actually passes electrical current to the tooth. With the vitalometer the operator can start at zero and gradually increase the amount of current until there is a mild reaction from the patient. The sensation produced by the vitalometer on a tooth has been described as a "tingling feeling." The vitalometer is shown in foldout 1. Like the transilluminator, the vitalometer tip must be disinfected with a chemical solution—not with heat-type sterilization. A different type of diagnostic aid is the dental radiograph.

Dental Radiographs. Dental radiographs, also known as dental X-rays, are very valuable as diagnostic aids. They are similar to small photographic negatives. (A periapical dental radiograph is shown in FO 1.) In this respect, a radiograph is a shadow image of a substance or body projected on radiographic film. The dentist looks at a dental radiograph as a negative image of the tissues of the mouth, and is able to diagnose, with the use of dental radiographs, oral conditions that would otherwise have been invisible. Dental radiology will be covered in greater detail in a subsequent chapter. One other aid frequently used by the dentist is the clinical thermometer.

Clinical Thermometer. The clinical thermometer has proved to be very valuable at times to help the dental officer determine the correct diagnosis. A clinical thermometer is shown in foldout 1. Sometimes, infections in the oral cavity increase body temperature. Whenever the dentist suspects that infection is present, he can use the thermometer to verify his tentative diagnosis. Keep thermometers disinfected in a cold, chemical solution. Some authors might include other items as diagnostic aids, but those we have presented are the primary ones used in the Air Force dental service.

Exercises (401):

1. Identify the diagnostic instruments and aids illustrated in foldout 8, exercise 401, by placing their name in the space provided below:

a. ________________________

b. ________________________

c. ________________________

d. ________________________

e. ______________________________

f. ______________________________

g. ______________________________

Complete exercises 2 through 6 by placing the appropriate letter from foldout 8, exercise 401, in the space provided.

___ 2. This instrument is used to detect small cavities and to check the depth of cavities. It is also used to determine the marginal qualities of fillings and to detect fractured tooth enamel.

___ 3. This instrument is used to direct light through the gingival tissues to detect certain gingival fluids, calculus, and foreign bodies.

___ 4. This instrument is used to carry cotton pellets to dry teeth and to apply medicaments and dressing.

___ 5. This instrument is used to view hard-to-see areas of the mouth, retract soft tissue of the mouth, and reflect light into dark areas.

___ 6. This instrument is used to determine the vitality of pulp-nerve tissues in teeth.

1-3. Rotary Instruments

The rotary instrument group includes a great number of small separate items. These instruments are made from many materials and combinations of materials ranging from diamonds to very finely detailed steel. Rotary instruments have many uses, among which are preparing cavities, finishing restorations, trimming dentures, polishing teeth, and removing bone in oral surgery cases. The rotary instruments are a vital part of most dental treatment procedures. Your responsibility with this group ranges from maintaining an adequate number in the treatment room to changing them in the handpiece. Rotary instruments may be categorized as burs, disks, wheels and points, and polishers. They are used in three different handpieces.

402. Identify the types and uses of the burs employed in dentistry.

Types of Handpieces. You have already learned that there are several types of handpieces used in dentistry. Each rotary instrument is designed for a particular handpiece. To indicate the handpiece in which a rotary instrument functions, handpieces have been categorized as friction grip, straight handpiece, and angle (latch) types. The abbreviation for friction grip instruments is FG and they are used in ultraspeed handpieces. These instruments have a small shank and are held in the handpiece by friction against a metal or plastic chuck. The abbreviation for straight handpiece rotary instruments is SHP. SHP instruments are used in conventional straight handpieces and slow-speed, air-driven straight handpieces. The shank on SHPs is larger in diameter than the FG shank and at least twice as long. The angle handpiece instrument (AHP) is used in conventional contra-angle handpieces. Common AHP rotary instruments have the same diameter as SHP instruments but are about half the length. However, some AHP instruments are made with a short shank. Foldout 1 illustrates the latch-type, the straight handpiece, and types of friction grip burs. Let us consider one family of the rotary instrument group, the burs.

Dental Burs. Dental burs are available in many sizes and shapes and are made of either steel or tungsten carbide. They are used in nearly all sections of the dental clinic. Dental burs are further classified as excavating, finishing, denture trimming, and dental surgery burs.

Excavating burs. The dental burs used by the dental officer to prepare cavities are known as excavating burs. They are designed for specific functions ranging from removing decay to making undercuts. The excavating bur designs are round, inverted cone, straight fissure, tapered fissure, and end cutting. Foldout 1 shows the various excavating bur designs:

a. Round burs are, as the name implies, in the shape of a sphere on a shank. They are numbered 1/4, 1/2, 2, 4, 6, and 8, with the largest number being the largest (as in all groups of burs). (See FO 1, bur sizes.) They are also available in steel and tungsten carbide for some numbers and used in contra-angle, friction grip, and straight handpieces. One exception is that all numbers may not be available for each handpiece. Round burs are designed to gain entrance into tooth structure and to remove decayed tooth substance.

b. Inverted cone burs are shaped like small cones inverted on the shank. In the *Federal Supply Catalog*, these burs are numbered 33½, 35, 37, and 39, with number 39 the largest There may be variations in the metal quality and sizes available for each handpiece. Inverted cone burs are used to make undercuts in the cavity preparation. These undercuts are necessary for the proper retention of filling materials. Otherwise, the filling materials might fall out of the prepared cavities.

c. Straight fissure burs are small cylinders with grooves machined into their outer walls. These grooves are either plain or crosscut. The plain fissures have semispiral grooves running generally lengthwise on the small cylindrical working end of the bur. Crosscut fissures have lengthwise grooves that have been further cut crosswise on the working end of the bur. The straight crosscut fissure burs are numbered 557, 558, and 559 in the *Federal Supply Catalog*. Most of the crosscut fissure burs are made from tungsten carbide. The straight plain fissure bur is number 57 in the *Federal Supply Catalog* and is available in the friction grip style only. The main use of straight fissure burs is to smooth and shape cavity walls.

d. Tapered fissure burs are small tapering cylinders with grooves machined into their outer walls. Like the straight fissure burs, the grooves on tapered fissure burs are available in plain or crosscut patterns. The *Federal Supply Catalog* lists the crosscut tapered fissure burs as numbers 699, 700, 701, 702, and 703. Most tapered fissure burs are made from tungsten carbide, and some numbers are not available for all three handpieces. The plain fissure tapered burs are also made of tungsten carbide and are used in friction grip handpieces (ultraspeed handpieces). Two plain tapered fissure burs are listed in the *Federal Supply Catalog*, numbers 169L and 170L. Tapered fissure burs are used to smooth and shape the walls of a cavity preparation, as are straight fissure burs. However, tapered fissure burs are particularly useful in preparing teeth for inlay and full crown restorations.

e. End cutting burs are small cylinders with the tip designed to cut tooth structure. The number 901 identifies this style of bur in the *Federal Supply Catalog*. It is available in both the friction grip and contra-angle types. The end cutting burs are used to shape and finish the gingival floor for crown and fixed partial denture preparations without the risk of removing more tooth structure from prepared cavity walls. The chief use of all of the burs we have discussed thus far is to remove tooth structures. Other types of burs are used to perform other functions and are divided accordingly. One of these is the finishing bur.

Finishing burs. Finishing burs (FO 1) are used to smooth and shape tooth-restoring materials. These burs are available in various shapes to enable the dentist to recreate, as closely as possible, the original shape of the tooth. Finishing burs are made of steel and are used in contra-angle and straight handpieces. These burs are easily differentiated from excavating burs by the fineness of the cutting blades on the working ends. The finishing burs for use in contra-angle handpieces are numbered 6, 200, 218, 224, and 242 in the *Federal Supply Catalog*. Those for use in the straight handpieces are numbers 200 and 224. The shapes of these finishing burs are easily described. The #6 bur is a rounded-spear shape; the #200 is round and often mistaken for a round excavating bur. Bur #218 is oval shaped, #224 is bud (flower bud) shaped, and #242 is sugarloaf or flame shaped. Another category of burs is the denture trimming variety. Foldout 1 shows three of them.

Denture trimming burs. The dentist uses denture trimming burs to trim acrylic resin denture base materials. For hand use, these burs are available for only the straight handpiece. Denture trimming burs are also used in lathes in the dental laboratory. Denture trimming burs are made of steel, and the working end is nearly as large as the crown of a tooth. The *Federal Supply Catalog* lists these bur shapes as flame, pear, and round. The last examples of dental burs are the dental surgery burs.

Dental surgery burs. Dental surgery burs are used either to cut bone or to cut tooth structure. Foldout 1 illustrates the surgical burs:

(1) The Henahan #41 bur is used to cut bone. It is sometimes used to remove the bone covering an impacted third molar. The Henahan #41 is a steel bur and is available for either the contra-angle (AHP) or the straight handpiece (SHP).

(2) The #703 straight handpiece bur is listed in the *Federal Supply Catalog* as a dental surgery bur. It is made of tungsten carbide, which makes it suitable for cutting either bone or the harder tooth structures. The oral surgeon sometimes uses this bur to completely or partially section a tooth for easier removal.

Exercises (402):

In exercises 1 through 8, identify the types and uses of dental burs by placing the appropriate letter or letters from foldout 8, exercise 402, in the space provided below each question.

1. Which burs are designed for use in the:
   a. Latch-type handpiece?

   b. Straight handpiece?

c. Ultraspeed handpiece?

2. Which burs are classified as finishing burs?

3. Which burs are used to cut bone or tooth structures during oral surgery procedures?

4. Which bur is designed to make undercuts in the cavity preparation?

5. Which bur is used to trim acrylic resin denture base materials?

6. Which burs are classified as excavating burs?

7. Which excavating bur is designed to gain entrance into tooth structure and to remove decayed tooth substance?

8. Which bur is called an end cutting bur?

9. In the spaces provided, enter the number(s) used to identify the following excavating burs:
a. End cutting ______________________ .
b. Inverted cone ____________________ .
c. Tapered fissure ___________________ .
d. Round __________________________ .
e. Straight fissure ___________________ .
f. Plain tapered fissure ______________ .
g. Plain straight fissure ______________ .

403. Answer key questions about the abrasive disks, wheels, and polishing instruments employed in dentistry.

Abrasive Disks. Abrasive disks are circular-shaped cutting instruments. They are used by the dental officer to cut tooth structures and to smooth and polish restorations. Disks are available in a wide variety of sizes, shapes, and abrasive grit. They are designed for contra-angle and straight handpieces. (See FO 1.)

Manufacturers provide abrasive disks either mandrel-mounted or unmounted. A mandrel is the shaft upon which a disk is mounted at one end while the other end inserts into the handpiece. Mandrels are available for contra-angle and straight handpieces. Some mandrels are designed to hold disks in place by spring tension; others are designed with a small screw in one end. Other mandrels are permanently mounted to the disk, such as certain types of diamond disks.

Small diamond chips are one of the cutting materials used on abrasive disks. These diamond chips, bonded to a metal base, make a very effective enamel-cutting material. The surface plane on diamond disks ranges from flat to concave to convex and usually one side is covered with abrasive chips while the other side is free of abrasives. Such disks are called safe-sided disks.

Other abrasives used in the fabrication of abrasive disks are aluminum oxide, flint, garnet, and silicon carbide. Aluminum oxide abrasives are available on either metal or plastic-backed disks. Flint, garnet, and silicon carbide abrasives are bonded to paper or plastic-backed disks. Some disks, such as the separating variety, are made only of silicon carbide and are pressed into the form of a double-sided abrasive disk held together by a bonding material. Another of the rotary instruments is the abrasive wheel.

Abrasive Wheels and Points. Abrasive wheels and points are very similar to abrasive disks. Their primary use is to reduce and smooth high spots on restorations and prosthetic devices. Like disks, wheels and points are either mandrel-mounted or unmounted, and use some of the same abrasives. (See FO 1.) The greatest difference is in the shape of the working end. Generally speaking, disks are thinner and usually the abrasive is on only one side. In wheels and points, the abrasive is usually on both sides and on the outer edge as well. Furthermore, wheels and points are sometimes made with different types of abrasives. For example, rubber impregnated with pumice or silicon carbide and glass is used to fabricate abrasive wheels. Still another difference is that some wheels and points can be used in ultraspeed handpieces, whereas disks are used in conventional speed contra-angle or straight handpieces. The last type of rotary instruments is the polisher type.

Polishing Instruments. Polishing instruments are usually used with an abrasive to remove stains or to polish teeth, restorations, and dental appliances. These polishers come in three forms—cup, brush, or buffing wheel. (See FO 1.) The polishing cup is made of rubber and is used to polish teeth and restorations. These cups screw into a slow speed, *right-angle* (prophylaxis) handpiece or into a contra-angle mandrel. An abrasive, zirconium silicate, is used with the polishing cup to polish natural teeth. The polishing brush screws into the right-angle handpiece like the polishing cup. It is made of natural bristles (swine hair) mounted on a screw stem. The polishing brush is used to remove stains from tooth fissures and other areas that the polishing cup cannot reach. The wheel-type polishers are used primarily in the dental laboratory for polishing dentures and other prosthodontic appliances. They range in diameter from three-fourths of an inch to 4 inches. Some of the materials used to fabricate these wheels are chamois, felt, cloth, and fiber bristles.

You must have the necessary rotary instruments available in your assigned dental treatment room. You must also properly clean, disinfect, sterilize, and store all dental instruments. Generally speaking, you should clean the excavating burs with a scratch brush and sterilize them in the autoclave. Discard paper- and plastic-backed abrasive disks after one use. Some steel burs should also be discarded after one use. Disinfect other abrasive disks and wheels in a chemical solution rather than in the autoclave. Autoclaving temperatures can affect the abrasive bond (glue). Sterilize all instruments to be placed in the patient's mouth by autoclaving or by using dry heat, if at all possible.

Exercises (403):

1. What is a mandrel?

2. What name applies to a disk that has one side covered with abrasives and the other side free of abrasives?

3. For what purposes would a dental officer use abrasive disks?

4. What are the primary uses of abrasive wheels?

5. What is the general difference between abrasive disks and wheels?

6. What types of handpieces can be used with abrasive disks?

7. For what tasks are polishing instruments usually employed?

8. How are the polishing caps and brushes used for prophylaxis secured in the right-angle handpiece?

9. For what use would a 3-inch diameter chamois polishing wheel be employed?

10. Why must some rotary instruments be disinfected rather than sterilized?

1-4. Miscellaneous Dental Instruments

Whenever attempts are made to divide a large group of associated items into logical subdivisions, it is practically inevitable that some problems arise. This, of course, occurs with dental instruments. Most dental items can be directly or primarily associated with a particular dental specialty; some, however, cannot. We can, however, combine such items in a "miscellaneous section." In this section we will discuss anesthetic syringes, rubber dam instruments, the vernier caliper, cotton roll holders, the saliva ejector mouthpiece, and the napkin holder. Refer to foldout 1 as we discuss these instruments.

404. Indicate, as true or false, statements about the items classified as miscellaneous dental instruments.

Anesthetic Syringes. Anesthetic syringes are used in dentistry to inject a local anesthetic. These syringes differ from most syringes because they are designed to inject anesthetic from a carpule. There are basically two types of syringes—the aspirating and the nonaspirating. They look similar, but the aspirating syringe has a small "harpoon" on the plunger that embeds itself into the rubber stopper of the carpule. This enables the dental officer to aspirate and see if he has entered a blood vessel. These syringes use disposable needles that are available in different gauges and lengths. Normally, you fit the syringe with a short needle (13/16-inch length) for maxillary injections, and a long needle ($1^{7}/_{8}$-inch length) for mandibular injections.

Rubber Dam Instruments. The rubber dam instrument set includes the rubber dam punch, rubber dam clamps, rubber dam clamp forceps, and rubber dam holder. These instruments prepare and maintain the position of thin sheets of latex rubber. The rubber dam itself is used to isolate a designated tooth or teeth in the mouth before certain restorative or endodontic procedures. The rubber dam actually keeps mouth fluids, tissues, and the tongue away from the operation site. Refer to foldout 1.

Rubber dam punch. The rubber dam punch is used to make the necessary spaced holes in the rubber dam. On the working end is a plunger on one side and a wheel on the other side, with holes of different sizes on the flat surface facing the plunger. These features enable the operator to select and adjust the wheel to punch a hole of the desired diameter in the rubber dam.

Rubber dam clamps. After the required number of holes are punched in the rubber dam, it is then stretched to fit over each designated tooth. To maintain a snug fit around the neck of the tooth, a rubber dam clamp is used. These clamps are made of spring steel in various sizes to fit the general contours of the different teeth. The space between the gripping edges is narrower than the diameter of the corresponding tooth. Thus, to place the clamp around the tooth, the gripping edges must be spread wider than the tooth diameter. To spread the gripping edges, a rubber dam clamp forceps is used.

Rubber dam clamp forceps. The rubber dam clamp forceps spreads the two working ends apart when the handles are squeezed together. On the working end are small projections that fit into two corresponding holes on the rubber dam clamp. The area between the working end and the handle is equipped with a sliding lock device. This locks the handles in position while the rubber dam clamp is being maneuvered around the tooth.

Rubber dam holder. To place and clamp a rubber dam around the tooth is not enough. The loose outer edges of the rubber dam sheets must be held to provide visible access to the tooth being treated. This is done with an instrument called the rubber dam holder. Most of the rubber dam holders used today are U-shaped. One of the more popular ones is called the Young's frame. When the edges are connected to the small, sharp projections on this U-frame, the dentist has adequate access and visibility to the area of treatment.

Vernier Caliper. The vernier caliper is frequently called the Boley gauge, and is calibrated in millimeters. It is used for precision measurement in the endodontic and prosthodontic treatment rooms and the dental laboratory. You can measure with the vernier caliper, whether you are using the side with points marked A and B or the opposing side marked with points Y and Z. (See FO 1.)

Cotton Roll Holders. Cotton roll holders are used mostly on the mandibular arch. They are designed in right and left types for the right and left sides of the arch. This instrument maintains the cotton rolls in position on both the lingual and facial sides of a tooth (or teeth). Cotton rolls held in such a position isolate or dam saliva from the area under treatment. Some cotton roll holders also have a metal plate to restrict tongue movement and a built-in saliva ejector.

Saliva Ejector Mouthpieces. Saliva ejector mouthpieces are connected to the saliva ejector hoses on dental operating units. This combination removes excessive saliva and small particles of debris from the patient's mouth. In this way, the area treated remains fairly free of obstructing fluids to provide the dental officer with needed continuous working time. Saliva ejector mouthpieces are available in two types—metal and plastic. The metal type can be cleaned, resterilized, and reused, but most dental clinics now use the disposable plastic type. The plastic type offers several advantages over the metal type. Plastic saliva ejector mouthpieces are conveniently discarded after use, they can be easily bent to the desired shape, and because of their softer and flexible quality, they are more comfortable for the patient. The last item in the miscellaneous group is the napkin holder.

Napkin Holder. The napkin holder is commonly called a towel chain. It holds a towel or paper napkin around a patient's neck during dental treatment. The chain is similar to the one that holds your identification tag around your neck; however, it has a small alligator clip on each end.

Exercises (404):

Indicate whether the statements below are true or false by circling the T or F located to the left of the statement.

T F 1 The anesthetic syringes used in dentistry are designed to inject anesthesia from a carpule.

T F 2. Short anesthetic needles are usually used for maxillary injections.

T F 3. You can easily distinguish the nonaspirating syringe from the aspirating syringe because the plunger of the nonaspirating syringe has a small, harpoon-type tip.

T F 4. Rubber dam clamps are made of

spring steel in various sizes to fit the general contours of the different teeth.

T F 5. The rubber dam punch produces the same size hole in the rubber dam for each tooth.

T F 6. The rubber dam is primarily used in the oral surgery section.

T F 7. Most of the rubber dam holders used today have an X-shape.

T F 8. The vernier caliper would never be used in the endodontic section.

T F 9. The vernier caliper is commonly called a Boley gauge.

T F 10. Cotton roll holders hold cotton rolls in such a position as to isolate or dam saliva from the area under treatment.

T F 11. The saliva ejector mouthpieces preferred by most clinics are constructed of plastic.

CHAPTER 2

Restorative Instruments

THE RESTORATIVE instrument group encompasses the largest portion of the entire dental instrument inventory. This group is composed of the instruments needed to prepare the teeth to receive restorations, to form matrices around cavity preparations, and to manipulate, carry, condense, and finish restorations. These are not, of course, the only instruments needed in the restorative section. Many of the diagnostic, rotary, and miscellaneous instruments already discussed are also employed in the restorative dentistry section.

2-1. Cutting Instruments

Many dental procedures require the use of instruments with sharp cutting edges. Because of the many hard-to-reach areas in the human mouth and the various functions required, cutting instruments are made in a wide variety of sizes and shapes. The cutting instruments we will discuss in this section are those that are primarily used in restorative dentistry. This cutting instrument group includes chisels, hatchets, hoes, gingival margin trimmers, and excavators. Other dental instruments have cutting edges but are usually included in a different group, such as the oral surgery or periodontic group. Refer to foldout 2 as you study the restorative cutting instrument group.

405. Identify the type and use of the cutting instruments in restorative dentistry.

Chisels. Dental chisels are frequently described as miniature wood chisels. The cutting edge is usually at a right angle to the axis of the blade. The shank width on a chisel is also constricted, compared to the blade width in most cases. Chisels are used to cleave (split) tooth enamel, to smooth cavity walls, and to sharpen line and point angles. Each chisel is designed to reach specific areas of the mouth. You need to be careful in handling chisels because the cutting edges are dulled very easily. Even though a dental instrument is made from the finest metal available, a slight blow of its cutting edge against a metal object greatly reduces its cutting ability. Some dental chisels are single-ended, whereas others have cutting edges on both ends. Basically, three types of chisels are used in restorative dentistry.

Wedelstaedt chisels. The Wedelstaedt chisels carry the identification numbers 41 and 42. They are a paired set. The bevel of the cutting tip on the #41 chisel is in the opposite direction from the bevel on the #42 chisel. The Wedelstaedts have slightly curved shanks and are used primarily on anterior teeth. Foldout 2 displays the Wedelstaedts. Slightly modified versions of this instrument design are the double-ended Black #3, #4, and #5, #6 chisels. Another type of restorative chisel is the straight chisel.

Straight chisels. The straight chisel group consists of the #48 and the Black #84, #85, and #86. As their names imply, they have straight shanks. You can see in foldout 2 that the #48 chisel has a broad triangular-shaped working end, while the #84, #85, and #86 chisels have straight working ends. The difference within this group of chisels is in their blade width. The #84 chisel is the broadest and the #86 the narrowest.

Biangle chisels. The biangle chisels carry the instrument identification numbers of 81 and 83. (See FO 2.) They have two distinct angles in their design, one at the shank and one at the working end. This design allows access to tooth structures that would not be possible with a straight chisel. A double-ended version of the biangle chisel is the Black #40 and #41.

Excavators. Among the dental hand instruments is the excavator group. In this instrument group are the hatchets, hoes, spoons, and other variations (claw, disk, and gouge) of the spoon-shaped working end.

Hatchets. A dental hatchet resembles a camper's hatchet in miniature. Like dental chisels, some have single cutting ends, and others have cutting edges on both ends of the handle. Hatchet blades are set at a 45° to 90° angle from the handle and shank. These instruments have different lengths and widths of blade. Hatchets are used on the walls of the cavity preparation to cleave enamel and cut dentin in order to help establish a sharp cavity outline. There are basically two types of hatchets: the bi-bevel and the single bevel.

a. Bi-bevel hatchets. The bi-bevel hatchets carry the instrument identification numbers of 8, 17, and 23. As the name implies, their cutting end is bi-beveled (see FO 2). The difference between these three instruments is in the size of their working ends. The #8 hatchet has the largest working end and the #23, the smallest.

b. Single-bevel hatchets. There are two pairs of single-bevel hatchets, and they are supplied as four single-ended instruments. The identification numbers of these instruments are 51, 52, 53, and 54. Numbers 51 and 52 are the larger pair and numbers 53 and 54 are the smaller pair. In addition, two double-ended hatchets are available: the Black #15, #16, and the Black #17, #18. In this case, the two working ends compose a pair. The instruments that comprise pairs are the same size, but their cutting edges have opposite bevels to permit access to different areas of the mouth. (See FO 2.) Another type of cutting instrument is the hoe.

Hoes. As you may have guessed, dental hoes look like a garden hoe in miniature. Like the dental hatchets, dental hoes are also included in the dental excavator group. They can be used very effectively to smooth and shape the floor of cavity preparations and to accentuate grooves and retention points. The identification numbers are 29 and 34.

Spoon-type excavators. This portion of the dental excavator family is made up of spoon-, claw-, disk-, and gouge-shaped blades. (See FO 2.) Their primary use is to remove carious debris from tooth cavities. Their tips and sides are designed for cutting action. These instruments are often referred to as spoons because their blades somewhat resemble miniature spoons. Excavators are occasionally used in carving wax inlay patterns and amalgam restorations. Those most resembling spoons are the paired Black #63 and #64, and the paired Black #65 and #66. These are single-ended instruments. Each instrument of the pair is designed for different areas of the teeth. Double-ended versions of this type of spoon are the Black #36, #37 and the Black #38, #39. The Darby-Perry (DP) #5, #6, #21, and #22 are excavators with gouge-shaped blades. These are also paired single-ended instruments. The DP #5 and #6 are the smaller pair, and the DP #21 and #22 are the larger pair. The last instruments in this family are the single-ended Black #89 and the single-ended Black #92. The #89 has a disk-shaped blade, and the #92 has a claw-shaped blade.

Gingiva Margin Trimmers. There are two pairs of single-ended gingiva margin trimmers in the Air Force inventory: the Black #77, #78 and #79, #80. The two instruments composing a pair are the same size; however, their working ends have opposite curvatures and bevels. (See FO 2.) Gingiva margin trimmers are used to trim, smooth, and shape the gingiva floor of a cavity preparation. These instruments are available in both single-ended and double-ended styles. There are four double-ended gingiva margin trimmers: the Black #26, #27, #28, and #29. Gingiva margin trimmers are also used to sharpen line angles on the gingiva floor for better amalgam retention and to level the gingiva floor on inlay preparations.

Exercise (405):

Foldout 8, exercise 405, shows the shank and working end of several cutting instruments. Each instrument is identified by a letter. In exercises 1 through 10 place the identification letter of each cutting instrument shown in foldout 8, exercise 405, in the appropriate space provided below.

____ 1. Biangle chisel.

____ 2. Disk-shaped excavator.

____ 3. Spoon-shaped excavator.

____ 4. Gouge-shaped excavator.

____ 5. Claw-shaped excavator.

____ 6. Wedelstaedt chisel.

____ 7. Gingiva margin trimmer.

____ 8. Hoe-shaped excavator.

____ 9. Hatchet-shaped excavator.

____ 10. Straight chisel.

11. Which letters in foldout 8, exercise 405, identify instruments that are primarily used to remove carious debris from tooth cavities?

12. Which letters in foldout 8, exercise 405, identify instruments that are used on the floor of a cavity preparation?

13. Which letters in foldout 8, exercise 405, identify instruments that are used on the walls of a cavity preparation?

2-2. Dental Matrices

If the walls of a tooth have been destroyed by decay or removed during the course of cavity preparation, they must be restored with restorative material. To do this, the dentist uses a matrix to approximate the original walls and to hold the filling material in proper form and position until it has time to harden. This matrix is similar to the "forms" a builder uses to hold semiliquid concrete in proper form and place until it hardens. Whereas the builder uses plywood, 2 x 4s, and nails to make his forms, the dental officer uses matrix retainers and materials to obtain the same effect. These matrices include matrix retainers, metal bands, wedges, matrix strips, and plastic crown forms. Refer to foldout 2 as we discuss the matrices.

406. From a list of statements, select those that are true concerning the types and uses of the matrices employed in dentistry.

Matrix Retainers. Matrix retainers are the devices that hold the matrices (metal bands or strips) firmly in place around a tooth. Matrix retainers and metal bands are used in combination to form a temporary mold while the filling material is being packed into place. These retainers have either small hooks or retaining screws at one end to hold the matrix band. On the other end of the retainer is an adjusting screw. When the adjusting screw is turned clockwise, the band loop is constricted. When the adjusting screw is turned counterclockwise, the loop is loosened. The *Federal Supply Catalog* lists two different types of matrix retainers—the Tofflemire, and the #1. (See FO 2.) The Tofflemire retainer is available in three different designs—the universal straight, the contra-angle, and the contra-angled junior size. These retainers are practically maintenance free. They can be heat-sterilized along with other dental instruments. Your part in maintaining matrix retainers is to check them periodically and replace those with badly worn screw threads. You are also expected to attach the correct matrix band to the appropriate retainer in anticipation of the dental officer's needs.

Matrix Bands. Matrix bands are very thin, flexible, stainless-steel bands that either partially or totally enclose a tooth. The bands used with the Tofflemire retainers completely encircle the tooth. The bands used with the #1 retainer partially encircle a tooth in a horseshoe or U-shape. Matrix bands come in assorted sizes and shapes in small envelope-type packages. A dentist usually prefers certain types of these bands over others. With practice, you should become very proficient in having the preferred band on the appropriate retainer. Matrix bands are also shown in foldout 2.

Wedges. Wedges are small tapering, triangular pieces of wood about 1/2 inch in length. Since the general shape of tooth crowns varies, the band around the tooth may not always produce a snug fit. This leaves space through which packed amalgam can extrude to create an undesirable overhanging restoration. The dental officer uses wedges to force the matrix band tightly against irregular tooth surfaces to eliminate these spaces. This snugly fitting band then restricts the firmly condensed amalgam to the confines of the prepared cavity margins and the band itself. Many dental officers use an instrument called a wedge holder to place the wedge in proper position. Another instrument sometimes used in positioning the matrix is the matrix contouring instrument #FP 2A. It is particularly useful for contouring the matrix during amalgam pin reinforcement procedures. (See FO 2.) Other matrices which the dental officer uses are called strips.

Matrix Strips. Matrix strips are manufactured in roll form. They are available in plastic and metal. The plastic type is clear polyethylene in a 45-foot roll. The metal type is available in three different kinds of metal—copper (20-foot roll), copper-nickel alloy (10-foot roll), and stainless steel (20-foot roll). The dental officer uses the plastic as a matrix for silicate and resin filling materials, and the metal as the base material from which he can cut the appropriate length to form a special matrix band. At times, the standard packaged matrix bands do not provide the necessary length, width, or shape for a particular cavity preparation. When this is the case, he can cut the metal matrix strips to form the needed band. Another type of matrix is available in crown form.

Matrix Crowns. Temporary matrix crowns are available in both clear plastic and corrosion-resistant steel construction. They are used to hold temporary or sedative filling materials in place on badly broken down or fractured teeth or to function as temporary crowns when permanent crowns are being fabricated by the dental laboratory. The clear plastic matrix crowns are available in the incisor, cuspid, and bicuspid shapes. These crowns are removed when the filling material sets, or are left in place to lend additional strength. Corrosion resistant steel crowns are available in the incisor, cuspid, bicuspid, and molar shapes. Because of their poor esthetic quality in anterior regions, they are primarily used on posterior teeth. There are other matrices used less frequently than those we have already mentioned. We will group them as "other matrices."

Other Matrices. These are the copper bands and the cervical types. Cervical (neck) matrices are made of plastic and are available in assorted sizes. The dentist uses cervical matrices to hold filling materials firmly in place on the facial necks of anterior teeth. Copper bands are not usually used with a filling material. Instead, they are used to hold an impression material until it is set. These copper bands are small cylinders open at both ends and available in several sizes. The dental officer may use them when making an impression for an inlay or a crown.

Exercises (406):

Indicate whether the following statements concerning matrices are true or false by circling the T or F.

T F 1. The item used to force the matrix band tightly against irregular tooth surfaces is called a wedge.

T F 2. The #1 matrix retainer should be used when the tooth must be completely encircled.

T F 3. Plastic matrix crowns are available in the incisor, cuspid, bicuspid, and molar shapes.

T F 4. Copper band matrices are usually used in conjunction with filling materials.

T F 5. Corrosion-resistant steel matrix crowns are primarily used on anterior teeth.

T F 6. Plastic strip matrix material is usually used as a matrix for silicate or resin filling material.

T F 7. Tofflemire matrix retainers should not be heat-sterilized.

2-3. Amalgam Instruments

While many instruments are involved in the restoration of tooth structure, certain instruments relate directly to amalgam filling material. Amalgam instruments are those that carry, condense, carve, and finish amalgam restorations. Study foldouts 2 and 3 in the supplement as we discuss this instrument group.

407. Identify amalgam instruments by their use and by their visible features.

Carriers. Amalgam carriers transport the freshly prepared amalgam filling material to the cavity preparation. These carriers have hollow working ends, called barrels, into which the amalgam is packed for transportation. Both regular and large barrel carriers are available. When the lever located on the top of the carrier is depressed, the amalgam is ejected into the cavity preparation. Normally two or more carriers are used during the amalgam placement procedure. This saves time for the dentist who is ejecting or condensing a carrier load while you are refilling the carriers.

Condensers. Amalgam condensers are instruments used to pack or condense the amalgam filling material into the cavity preparation. They are often called pluggers. The hammerlike working end is large enough to compress the soft amalgam without sinking into it. They are available in single- and double-ended designs. Condensers also have variously shaped and sized working ends. They may be smooth or serrated. Normally the dental officer favors certain condensers, which he uses routinely. You should be aware of his preference and have the condenser he wants available at the start of the condensing procedure. The condensers available through Air Force supply channels are listed below and are pictured in foldout 2:

Single-ended condensers
Black #1, #2, #3, #4, and #5

Double-ended condensers
Sweeney #1, #2, #3, #4, #5, #6, and #7 Tanner #OT, #2T, #3T, and #4T Modified Mortonson #2

Carvers. After the amalgam is condensed, it must then be carved to approximate the original tooth structure. Carvers are available in an assortment of shapes and sizes and in single- or double-ended designs. They have sharp cutting edges to shape, form, or cut tooth anatomy into amalgam restoration. Some carvers are also used to carve wax patterns for crown and inlay fabrication. As with condensers, dental officers also have favorite carvers which they use routinely. Know the dental officer's preference so that you can have the desired instrument ready when it is needed. The carvers available through Air Force supply channels are listed below (see FOs 2 and 3):

Single-ended amalgam carvers
Tanner #6TA and #6TB

Double-ended amalgam carvers
Cleoid, Discoid #89-92
Hollenback #½
#14 or "H"
Tanner #5T

Single-ended amalgam and wax carvers
Frahm #1, #2, and #3

Double-ended amalgam and wax carvers
Hollenback #1, #2, and #3
Walls #3

Burnishers. When the carving has been completed, burnishers can be used to smooth and polish the restoration and remove scratches left on the surface of the amalgam by the carving instruments. Single- and double-ended burnishers have smooth rounded working ends. These burnishers are listed below and pictured in foldout 3:

Single-ended burnishers
Ovoid, large #28
Ovoid, medium #29
Round, large #25
Round, small #27

Double-ended burnishers
#15 or "J"

Finishing Instruments. Finishing instruments are sometimes used to complete or put the "finishing touches" on a restoration. The finishing instruments most often used in Air Force dental clinics are the margin-finishing knives and margin-finishing files.

Margin-finishing knives. The Black #8 margin-finishing knife is often called the gold knife. It has a large sickle-shaped blade and is used to remove excess filling material from the margins of restorations. Another finishing knife is the Baird knife. It is quite similar to the Black finishing knife, but has a detachable handle. (See FO 3.)

Margin-finishing files. The most commonly used margin-finishing files are the Rhein #31 and #32 files. The working end of these files is small and disk-shaped, as illustrated in foldout 3. The filing surface is on the front disk surface of one instrument and the back disk surface of the other. This permits access to any area of the mouth. They are used to smooth and finish the margins of metallic restorations and to remove excess hardened amalgam (overhang) that extends beyond the intended boundaries of the prepared cavity.

Pin Amalgam Set. Extensive decay or a cusp fracture results in the loss of a major portion of the tooth structure. To restore such a tooth to its former healthy condition, the dental officer may choose to rebuild the tooth. If the tooth is a posterior one, the dental officer may use the pin amalgam technique. For a pin amalgam, the dentist uses specific instruments. Many times these pin amalgam instruments are kept together as a set (see FO 3), which includes pinhole drills, pin drivers, pins, and perhaps grooved or threaded wire. The set available in the *Federal Supply Catalog* includes drills of two different lengths, pins of two different lengths, and one package of grooved wire.

Pinhole drills. The dentist uses the pinhole drills to drill holes in the dentin portion of the tooth to receive pins or wire of corresponding size. The pinhole drills closely resemble dental burs, and are made for use in conventional speed handpieces. The actual drilling part of these drills varies from .021 inch to .027 inch in diameter. They are available in lengths of either 55/64 inch or 1³/₈ inches. The shorter drills are used in contra-angle handpieces on posterior teeth. The longer drills are used in straight handpieces on anterior teeth.

Pin drivers. Pin drivers hold, place, and drive or screw the pins into the dentin part of a tooth. These drivers are of two different types—friction-lock and thread-forming. The friction-lock type drives grooved pins and grooved wire into the prepared holes. The thread-forming type screws thread-forming pins and wire into place. The friction-lock driver is available in straight or bayonet shapes.

Pins. The pins used in the pin amalgam technique are very small. For example, some are less than 1/4 inch long and .022 inch in diameter. These pins are available in grooved and threaded forms. The grooved type actually locks in place in the tooth dentin by friction, with the spiral grooves providing retention for the amalgam filling material. The threaded type is screwed into place or cemented with zinc phosphate cement. The threads on this type of pin also help retain the filling material. Each type can be obtained in different lengths and diameters. Although pins are used in amalgam restorations for the most part, they can be, and are, used to reinforce other filling materials.

Wire. Although designed specially for the same purpose as the precut pins above, some retention material is in wire form. Like the pins, retention wire is also available in grooved or threaded form. Most of these wires are made of a corrosion-resisting steel and are in 4³/₄- and 6-inch lengths.

Also like the pins, different diameters are available. One advantage of the grooved retention wire is that it can be cut at the precise length needed. This feature is particularly helpful when the precut pin lengths would be either too short or too long. The pin length can be critical in the success or failure of large pin amalgams.

Condensers. Because of the difficulty experienced in packing amalgam around pins, special condensers have been designed for this purpose. These are the double-ended Markley #1, #2, #3, #4, and #5 condensers. Their function is the same as that of the amalgam condensers previously discussed. The condensers designed for use with pins do, however, have much narrower working ends.

Exercises (407):

Answer exercises 1 through 6 by placing the identification letter or letters of the instruments pictured in foldout 8, exercise 407 in the spaces provided.

____ 1. Which letters identify instruments used to condense amalgam?

____ 2. Which letters identify instruments that are used to carve anatomy into amalgam restorations?

____ 3. Which letter identifies the instrument used to drive pins into the dentin?

____ 4. Which letters identify instruments used to remove scratches left on the surface of an amalgam by carving instruments?

____ 5. Which letter identifies the instrument that is used to transport freshly mixed amalgam to the cavity preparation?

____ 6. Which letters identify instruments used to remove "overhangs" from amalgam restorations?

Identify the instruments listed below by placing the identification letter from foldout 8, exercise 407 in the space provided:

____ 7. Ovoid large burnisher.
____ 8. #8 finishing knife.
____ 9. Pin driver.
____ 10. Black condenser.
____ 11. Rhein file.
____ 12. #15 or "J" burnisher.
____ 13. Amalgam carrier.
____ 14. Cleoid, discoid carver.
____ 15. Hollenback #3 carver.
____ 16. Sweeney condenser.

2-4. Resin and Cement Instruments

This instrument group consists of the instruments for mixing and handling restorative resin, silicate cement, and various temporary filling, insulating, and pulp-capping materials.

408. Answer key questions about the instruments employed to mix and handle the resin and cement materials.

Spatulas. There are three different spatulas available for mixing restorative materials. (See FO 3.) Some of these spatulas can produce a slight discoloration in the material being mixed. The selection of a mixing spatula is not critical except when a permanent anterior restoration is being prepared. Silicate cement, in particular, has a tendency to discolor easily. Therefore, when you are preparing this material, it is extremely important to use the proper spatula to prevent ruining the esthetic value of the restoration. The spatula designed for mixing silicate is the double-ended #142 plastic spatula. The two other spatulas available are the #313 and the #324. Each of these has a single semiflexible working end and is suitable for mixing materials other than silicate. The #313 spatula is a smaller version of the #324 and is used for mixing small quantities of cement. Thoroughly clean and disinfect the spatulas after each use.

Plastic Filling Pluggers. A variety of single- and double-ended instruments compose this instrument group. They are used to transport and place dental cements, resin, and temporary, insulating, and pulp-capping materials. The working ends on plastic filling pluggers range from varying small cylinders to assorted angled, paddle-like shapes. These instruments are listed below and are pictured on foldout 3. All of these instruments are constructed of corrosion-resistant steel, except for #1—2 and 5—7, which are constructed of chromium alloy. The chromium alloy instruments are more suitable for handling restorative resins and silicate cement. Since these instruments are used in the mouth, they should be sterilized after each use:

Single-ended plastic filling pluggers
Gregg #1, #2, and #3.

Double-ended plastic filling pluggers
Ladmore #3
#1--2
#5--7
Woodson #1, #2, and #3

Exercises (408):

1. Which spatula should be used to mix silicate cement? Why?

2. How does the #313 spatula differ from the #324 spatula?

3. What should be done with a spatula after it has been used?

4. What is the purpose of plastic filling pluggers?

5. Which plastic filling pluggers are constructed of chromium alloy?

2-5. Gold Foil Condenser Set

The gold foil condenser set (FO 3) includes an automatic gold plugging mallet, interchangeable points for the mallet, the gold foil carrier, and an annealing tray. These instruments are used to fill selected and prepared cavities with gold foil.

409. Furnish specific facts about the instruments in the gold foil condenser set.

Gold Foil Mallet. The automatic gold plugging mallet is hand-operated. It is double-ended and equipped with a spring catch, which releases when a certain amount of pressure is applied. In turn, this produces a light, adjustable, hammerlike tap that condenses the gold foil. The mallet is used with the gold foil plugger points.

Interchangeable Points. The tips of the seven interchangeable gold foil plugger points are serrated. The *Federal Supply Catalog* lists them as #1, #2, #3, #4, #5, #6, and #10. Since each point has a different shape, a point is available to fill almost any conceivable cavity preparation. These threaded points screw into either end of the automatic gold plugging mallet.

Gold Foil Carrier. The gold foil carrier looks like a #23 explorer. Only with a close examination of the small working tip can you distinguish a significant difference. The tip of the gold foil carrier has a tiny, flat, serrated surface. The instrument is used to transport gold foil pellets or cylinders from the annealing tray to the cavity preparation.

Annealing Tray. The annealing tray holds gold foil pellets or cylinders for heating. This tray is designed to slip over the Bunsen burner tube found on most dental units. When it is properly placed, the tray lies horizontally and immediately over the Bunsen burner. The heating (to burn off the gas coating) and proper cooling of the gold before it is condensed into the cavity is called annealing. Annealing allows the gold foil to adhere (autoweld) to itself and contributes to a well-bonded restoration.

Exercises (409):

1. Why are the interchangeable points of the gold foil condenser set constructed in different shapes?

2. What instrument does the gold foil carrier closely resemble? How does it differ?

3. Where on the dental unit is the annealing tray mounted?

4. What is the purpose of the annealing tray?

Specialty Instruments

DENTISTRY IS a highly specialized profession. In addition to the general dentists, in many Air Force dental clinics, oral surgeons, periodontists, endodontists, and prosthodontists are assigned to serve the base population. For each of these specialists, instruments have been designed to help him in the performance of his specialty. In this chapter we will discuss these specialty instruments.

3-1. Surgical Instruments

The instruments used to remove teeth or to treat the oral conditions that require cutting and bone removal are called oral surgery instruments. These instruments are constructed of high-grade steel, either stainless or chrome-plated. Each instrument is designed for a particular pupose and should be handled with extreme care. The instruments with cutting edges must be kept sharp to prevent slippage and possible injury to the patient. Hinged instruments should be lubricated to keep them in good operating condition and to prevent rust. Although some 80 oral surgery instruments are available through supply channels, these instruments can be separated into groups for easy reference. Keep in mind, as we discuss these groups, that most surgical procedures require several different instruments. Our discussion of surgical instruments begins with the tooth-extracting and miscellaneous forceps group.

With the exception of the Rongeur forceps, which is used to cut bone, most forceps are grasping-type instruments. They are used to grasp teeth for extraction, secure patient drapes, hold suture needles, grasp oral soft tissues, transfer instruments and dressing materials, and control hemorrhage. The bulk of the forceps group is composed of those used for extracting teeth.

410. Identify the tooth extraction forceps used in the oral surgery section.

Tooth-Extracting Forceps. There are several variations of tooth extracting forceps on the market, but except for those made for some specific operation, they generally follow certain basic principles. The forceps consist of three parts—the beaks, the neck, and the handle. The beaks of tooth-extracting forceps are designed to grasp the tooth with maximum contact on the facial-lingual surfaces of the root(s) just below the cervix. The inner surface of each of the two beaks is concave and the outer surface is convex. Tooth-extracting forceps are designed to be used in specific areas of the mouth. The beak is always shaped to conform snugly to the contour of the tooth. For example, both beaks of maxillary forceps are usually angled away from the curvature of the handles. These varying angles facilitate access to various parts of the arch. The beaks of mandibular forceps are usually at a much sharper angle and in the same direction as the curvature of the handles. This makes it easier to reach different parts of the lower arch. The notches on the beaks serve as a guide to the region of the mouth where that particular forceps is to be used.

To identify the forceps, picture to yourself the number of roots on the tooth to be removed. All anterior teeth have single roots and need forceps with a single curve on the end of each beak. If you examine the tips of anterior forceps "head on," you will find that they resemble a set of parentheses, as illustrated in figure 3-1. Forceps for removing bicuspids are similar to those for anterior teeth, with the beaks resembling a set of parentheses. But they are generally wider than those used for anterior teeth. When you remember that lower molars have two roots, situated mesially and distally, you can easily see that any instrument designed to follow the curve of the root of the lower molars must be notched. The beaks of lower molar forceps are notched and, when examined head on, resemble two sets of parentheses arranged in the manner shown in figure 3-1. The exception to this is the mandibular "cowhorn" forceps whose beaks resemble cowhorns. These beaks enter into the bifurcation facially and lingually to lift the tooth out of the socket.

Upper molar teeth have three roots—two facial and one lingual. To be effective on these teeth, the forceps must have a notched beak on the facial side and an unnotched beak on the lingual side (except

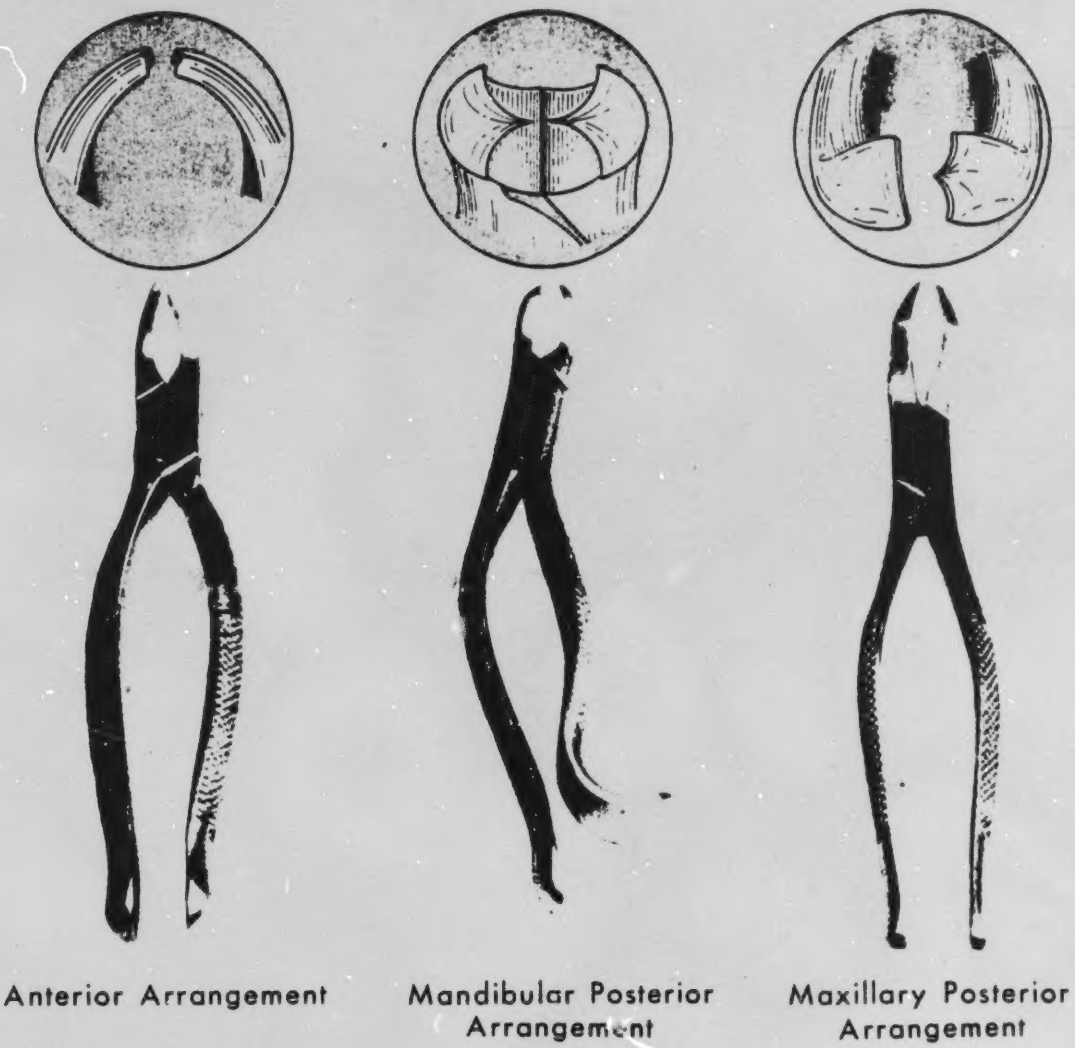

Anterior Arrangement
Mandibular Posterior Arrangement
Maxillary Posterior Arrangement

Figure 3-1. Beak arrangement of tooth extracting forceps.

for the 88 R and L, maxillary cowhorn forceps, which are just the opposite). You can, therefore, see why upper molar forceps are manufactured as "right" and "left" forceps. Some manufacturers stamp the letters "R" and "L" on the handle, but even without this identification it is easy to determine which side of the mouth they are designed for if you remember the position of the notches in relation to the roots. By relating the parentheses to the upper molar forceps, you will find that, for the right and left sides, the parentheses are arranged to oppose each other. This arrangement is shown in figure 3-1.

Another way of telling the general area of the mouth in which a tooth-extracting forcep should be used is by its neck. The neck is shaped so that the beak can be placed on the tooth and still be parallel with the long axis of the tooth. The handles are shaped so that a maximum amount of force can be applied to the beaks and the handles are still in a comfortable position for the oral surgeon. The beaks are also shaped so that a force on the handles tends to extrude the tooth out of its socket.

Since more than one forceps design is available for the extraction of any tooth, the dental officer usually chooses the one that he feels is most comfortable and gets the best results. Consequently, different dentists elect to use different forceps. You should know the basic principles of determining where a forceps is designed to be used. You can then adapt these principles to the needs of the individual dental officer. Let's examine the various tooth extraction forceps in the Air Force inventory. Refer to foldout 4 as we discuss these instruments.

Tooth-extracting forceps #1. The #1 extracting forceps is designed to remove maxillary anterior teeth and in particular maxillary cuspids. The beaks (grasping parts) are in line with the handle. Because of this straight line design, much leverage can be exerted with the #1 forceps.

Tooth-extracting forceps #150. The #150 forceps is sometimes referred to as the maxillary "universal" forceps. The beaks are set at an angle in relation to the handles, which makes them accessible to any part of the maxillary arch. When the handles are closed, the beaks on the #150 forceps are noticeably close together at the tips and curve opposite each other to resemble parentheses. Notice also that the handles themselves have a slight curvature. Even though the #150 forceps can be used in any region of the maxillary arch, it is specifically designed to remove maxillary incisors, cuspids, bicuspids, and residual roots. There are two other types of #150 forceps that possess certain modifications. One is a scaled-down version (#150S) for use in removing maxillary deciduous teeth. The third version is the #150AS. This forceps has slightly thicker beaks with less curvature and more space between the beak tips when the handles are closed. The #150AS is used on maxillary incisors, cuspids, and bicuspids, as is the #150.

Tooth-extracting forceps #65. The handles of the #65 forceps are straight and the beaks are offset. When the forceps is in the closed position, it resembles a bayonet. The beaks are short, very narrow, and slender. The #65 forceps is used on maxillary anteriors, bicuspids, and root tips.

Tooth-extracting forceps #286. The tooth-extracting forceps #286 is very similar to forceps #65. The biggest differences are that the #286 beaks are wider and there is a wider space between the beaks nearest the handles when they are closed. These characteristics make the #286 a little more suitable than the #65 for removing maxillary bicuspids. The #286 is also used to remove maxillary anterior teeth and residual roots.

Tooth-extracting forceps #53L and #53R. The #53L and #53R forceps are designed to extract maxillary first and second molars. The letters L and R indicate that the forceps are for use on the left and right sides of the maxillary arch. They have straight handles with offset bayonet-type beaks. When you view the #53L forceps with the handles toward you and the beaks away from you, a pointed projection is visible on the right beak tip, whereas the left beak tip is rounded. The opposite is true on the #53R forceps. As you remember from your study of dental anatomy in Volume 2, maxillary first and second molars have three roots. Two of these three roots are toward the facial surface, while the other is a single lingual root. Thus, the right beak of the #53L forceps engages the maxillary left first or second molar crown and enters between the two facial roots while the concave left beak engages the lingual part of the crown and root. The exact opposite is true with the #53R forceps and the maxillary right first or second molar. Such a design enables the dental officer to grasp the tooth securely for the rocking and elevating movements.

Tooth-extracting forceps #88L and #88R. The #88L and #88R forceps are often called maxillary cowhorns. Like the #53L and #53R, they are designed for the maxillary first and second molars. They differ slightly from the #53L and #53R in the way they function to remove a tooth. The primary use of the #53L and #53R forceps is to grasp the crown and root portion of a tooth so that the dentist can rock the tooth from its socket. The #88L and #88R forceps operate on a wedging principle. They are actually inserted between the tooth roots and the surrounding bone. This wedging action tends to lift the tooth from its socket. The #88L forceps is designed with a long, slender, pointed right beak and a forked or deeply notched left beak for grasping the root structures on maxillary left first and second molars. The exact opposite applies for the #88R forceps and maxillary right first and second molars. The #88L and #88R forceps have straight handles.

Tooth-extracting forceps #210. The #210 forceps is designed to extract maxillary third molars. The short beaks on these forceps have smooth rounded tips and wide concave inner surfaces. When these forceps are held in the operating position, the end of the left handle is noticeably curled to form a finger rest. These characteristics make the #210 different from the other maxillary molar forceps. The wide inner concave surfaces on the short beaks make the #210 forceps particularly effective in grasping the generally underdeveloped maxillary third molar crowns. The #210S forceps has a slightly wider beak than the #210, and the finger rest curl is absent. It is also used to extract maxillary third molars.

Tooth-extracting forceps #101. This forceps is used on both the maxillary and mandibular arches. More specifically, the #101 forceps is to be used for removing maxillary and mandibular cuspids, bicuspids, and any remaining roots.

Hawkbill-type forceps. Three different forceps fall into the "hawkbill" category: the Mead #MD3, the #13, and the #22. Their beaks are perpendicular to the working action of the handles. This design permits a great deal of leverage to be exerted with a minimum amount of effort. The major physical difference between these forceps is the width of their beaks. This, as you may have surmised, is because they are designed to extract different teeth. The Mead #MD3 forceps is designed for the extraction of mandibular anteriors and bicuspids; the #13 forceps is for mandibular first and second bicuspids; and the #22 forceps is for the extraction of mandibular first, second, and third molars.

Tooth-extracting forceps #151. The #151 extracting forceps is similar to the #150 forceps except that the beaks are set at an angle opposite to the slightly curved handles. Another similarity between these forceps is that as the #150 is known as the "maxillary universal" forceps, the #151 is known as the "mandibular universal" forceps. The #151 is used primarily to extract mandibular anteriors, bicuspids, and roots. There is still a third similarity between the #150 and #151 forceps. Each has two additional versions to the basic forceps. The #151AS is smaller and is used to extract mandibular deciduous teeth. The #151A has slightly thicker beaks, with more space between them than between the beaks of the basic #151 forceps. The #151A is used in the same way as the #151 forceps.

Tooth-extracting forceps #203. The #203 forceps is used on mandibular anterior, bicuspids, and roots. These forceps are like the #101, except that the beaks are more sharply angled from the handles. Like the #101 handles, the #203 handles are straight.

Tooth-extracting forceps #15. Forceps #15 is designed to remove mandibular first and second molars. The beaks on these forceps have concave inner surfaces with pointed projections on the tips. These work well in grasping the crown with the two projecting tips extending to the bifurcation between the two roots on mandibular third molars. The left handle on the #15 has a finger rest.

Tooth-extracting forceps #16. The #16 forceps is nicknamed "mandibular cowhorns," because the beaks actually resemble cowhorns. This is especially true when the beaks are viewed in an open position. The #16 forceps is used to remove mandibular molars. The long, slender, curved beaks function on the same principle as the #88L and #88R forceps. The #16 forceps wedges between the tooth roots and the surrounding bone and, with pressure and a rocking motion, lifts the tooth from its socket. The left handle on the #16 forceps has a finger rest.

Tooth-extracting forceps #17. The beaks of the #17 forceps are similar to beaks of the #15 forceps. The handle of the #15 forceps is straight without a curled finger rest. Like the #15 and #16 forceps, it is used on lower first and second molars.

Tooth-extracting forceps #217. The #217 forceps is used primarily for removing mandibular third molars. The beaks have inner concave surfaces and pointed projections much like those of the #15 forceps. The handles, however, have a slight curvature and resemble those on the #151 forceps.

Tooth-extracting forceps #222. The beaks on the #222 forceps are rounded with concave inner surfaces, and angle sharply from the handle. Like the #217, it is also used to extract lower third molars.

Exercises (410):

1. Name the three parts of the extraction forceps.

2. How are the beaks of extraction forceps shaped?

3. When you are viewing lower molar forceps head on (with the exception of the mandibular cowhorns), what do their beaks resemble?

4. With the exception of the 88R and 88L forceps, what is the beak configuration of upper molar forceps?

5. How are the necks of extraction forceps shaped?

Foldout 8, exercise 410, shows several extraction forceps. Each is identified by a letter. Complete exercises 6-16 by placing the appropriate letter in the space provided.

___ 6. Identify the three forceps that are designed exclusively for use in the maxillary arch.

___ 7. Identify the four forceps that are designed exclusively for use in the mandibular arch.

___ 8. Which forceps may be used to extract either maxillary or mandibular cuspids, bicuspids, or roots?

___ 9. Which forceps is referred to as the hawkbill forceps?

___ 10. Which forceps is referred to as a maxillary cowhorn forceps?

203

196

____ 11. Which forceps is referred to as the mandibular cowhorn forceps?

____ 12. Which forceps is used for extracting maxillary anteriors and in particular maxillary cuspids?

____ 13. Which forceps is used for extracting maxillary anteriors, bicuspids, and root tips?

____ 14. Which forceps is designed specifically for extracting a maxillary left first or second molar?

____ 15. Which forceps (other than the hawkbill type) is designed for extracting mandibular anteriors, bicuspids, and roots?

____ 16. Which forceps (other than the cowhorns) is used for extracting mandibular molars?

411. Match the type of miscellaneous forceps used in the oral surgery section with the correct descriptive statement.

Miscellaneous Forceps. As we mentioned earlier, many forceps common to the oral surgery area are not used to extract teeth, and we have rather arbitrarily placed them in a "miscellaneous" group. Let's take a closer look at these forceps.

Needle-holder forceps. The needle-holder forceps is used, as the name indicates, for holding needles during suturing procedures. The typical needle holder has two short, rather blunt, serrated beaks, which hold the curved suture needles very securely. A graduated, notched, locking device is located near the end of the handles. This locking device enables the oral surgeon to lock the suture needle in the suturing position as if the needle were an extension of the needle holder. In turn, the operator can devote his full attention to the suturing process and not be overly concerned about maintaining a secure grip on the needle.

Hemostatic forceps. The hemostatic forceps looks very much like the needle-holding forceps. The main difference is that the beaks of the hemostatic forceps are longer and more slender. The hemostatic forceps are supplied with both curved and straight beaks. The handles of these forceps are also equipped with a locking device to keep the beaks closed. They are used in general surgery, to control hemorrhage by clamping or constricting blood vessels. However, in oral surgery they are more commonly used to remove bits of debris, such as bone chips or parts of teeth, from the oral cavity. Hemostatic forceps are a necessary part of all surgical setups you prepare. You should have them ready during all procedures that involve the removal of teeth or bone.

Towel-clamp forceps. As the name implies, the towel-clamp forceps is used to maintain surgical towels and drapes in operating position during surgical operations. The towel-clamp forceps has handles and a locking device similar to those on the needle holder and hemostatic forceps. The working ends have sharp points that overlap in the closed position. The towel-clamp forceps is a part of every instrument setup used in the hospital operating room and is being used more and more in dental surgery operations.

Gauze forceps. The gauze forceps is used to grasp sterile gauze sponges. It is long handled and has two ring-shaped beaks, which permit you to secure several gauze sponges at once. In some cases where extensive surgery is being performed, the aspirator is only partially effective. The patient is in such a position that the blood drains toward his throat. If so, you should be ready with sponges, locked in the gauze forceps, to absorb the blood at every opportunity. The gauze forceps is also used when the surgeon is performing multiple extractions under general anesthetic. He may soak several sponges (locked in the gauze forceps) with metaphen and swab the oral cavity for preoperative disinfection, or with epinephrine to staunch blood flow.

Surgical dressing forceps. The working ends on the surgical dressing forceps used in oral surgery are straight extensions of the handle. This instrument resembles large straight tweezers. Its inner surfaces are serrated. The forceps is used to transport gauze sponges, towels, and patient drapes. Using surgical dressing forceps to transport these items prevents contamination.

Tissue forceps. The tissue forceps, at first glance, appears to be a surgical dressing forceps with straight working ends. Upon closer examination of the working end, however, a marked difference is easily detected. One side of the working end has two very small, sharp, pointed extensions, which form a W-shape. The other side of the working end has a single, sharp, pointed extension that meshes in the middle of the opposing W-shape when the

204

instrument is in the closed position. Although the tissue forceps is used in oral surgery to grasp and stabilize loose tissue ends during suturing procedures, it is mainly used to hold tissues being excised.

Instrument forceps. The instrument forceps is designed to handle instruments. It is used, primarily, to transfer instruments from surgical cabinets to surgical operating trays or to other areas as needed. The handles look like those on hemostatic forceps, but the instrument forceps do not have the locking device. The working end is such that it can be manipulated to hold nearly any instrument securely, regardless of its shape. One side of the working end is basically a curved fork. The other side is a curved arm that meshes between the two opposing fork tines. Instrument forceps should be stored in an upright instrument forceps canister containing fresh disinfectant solution.

Exercises (411):

Complete exercises 1 through 7 by matching the statement in column B to the appropriate instrument in column A. Each statement should be used only once.

Column A

____ 1. Gauze forceps.
____ 2. Instrument forceps.
____ 3. Tissue forceps.
____ 4. Hemostatic forceps.
____ 5. Dressing forceps.
____ 6. Needle-holder forceps.
____ 7. Towel-clamp forceps.

Column B

a. This forceps resembles large straight tweezers.
b. Used primarily in oral surgery to remove bone chips or other debris from the oral cavity.
c. This forceps has long straight handles with ring-shaped beaks.
d. This forceps has a locking device, and its beaks have sharp points that overlap when in the closed position.
e. One side of this forceps' working end has small, pointed extensions that form a W-shape.
f. One side of this forceps' working end is basically a curved fork.
g. This forceps has short, blunt, serrated beaks that are used to hold a suture needle securely.

Cutting Instruments. When most people hear the word "surgery," the first thing they think about is the cutting of the body with knives. But knives are not the only cutting instruments used in surgery, particularly oral surgery. Although knives are used in oral surgery, there are many other instruments—bone files, surgical scissors, and curettes—that perform some type of cutting function. Refer to foldout 4 as we discuss these instruments.

412. Describe the cutting instruments used in the oral surgery section by type, features, and purpose.

Surgical knives. The surgical knife handles and blades are used to incise or excise soft tissues, and come in various sizes and shapes. The use of each type depends upon the type and accessibility of the tissue to be cut. Knife blades are supplied in presterilized packages and should be discarded after one use. The reason is that a nicked blade will not make a clean cut and thus would delay the proper healing of the tissue. Attach and remove the blades from the knife handles with hemostatic forceps. The use of the forceps prevents accidental cuts and possible infection. The knives used in oral surgery are usually referred to as scalpels or Bard-Parkers.

There are two surgical knife handles commonly used—the #3 and the #9. The #3 handle is short and wide, whereas the #9 is fairly long and slightly thicker but narrower than the #3. The four blades used most often in oral surgery are #10, #11, #12, and #15.

a. Blades #10 and #15 have similar working ends. The greatest difference is that the #10 blade is larger. The cutting edge on both of the blades is on the curved part of the blade. Thus, they cut in either a straight or rocking fashion.

b. Blade #11 has a straight cutting edge and is used for lancing.

c. The #12 blade has a concave cutting edge, is shaped like a hawkbill, and is used in a ripping motion.

Rongeur forceps. The Rongeur forceps is used for trimming projecting, uneven, or overhanging bone (alveolectomy), usually after multiple extractions and before tissue suturing. Since these sharp bony projections resulting from the extraction would be a constant source of pain to the patient and would make the wearing of a denture impossible, they must be trimmed. The Rongeur forceps function like large toenail clippers and snip off the bony projections. Some Rongeur forceps are so shaped that they cut on only one side. Others are designed to cut on the ends of the beaks. The cutting edges are sharp and should be examined for nicks after each use. Note that these forceps are similar in size and appearance to the tooth extracting forceps, but each Rongeur has a steel spring spreader, which opens the beaks when the pressure is released from the handles.

Bone file. Although most of the bony projections are removed with the Rongeur forceps, some rough edges usually remain. The bone file is now used to further shape and smooth the alveolar bone. The Seldin #11 bone file is used in most Air Force dental clinics. It is a double-ended instrument, with both a large and a small working end.

Surgical scissors. Scissors are used in oral surgery to cut tissues and sutures. The scissors with saw-toothed cutting edges are used to trim excess or irregular soft tissues, while those with smooth blades are normally used for cutting sutures or other fabric material. The surgical scissors listed in the *Federal Supply Catalog* include a smooth-blade, blunt-ended pair, and the angular, saw-toothed Dean scissors.

Surgical burs. Surgical burs are rotating cutting instruments used by many surgeons to remove bone or cut through teeth. They are made for both straight and contra-angle handpieces. The burs are shaped much like regular toothcutting burs, but the blades of the surgical burs are farther apart so that they can cut hard tissue without burnishing it. They must be thoroughly scrubbed after each use to remove bone particles and blood from between the blades. These burs were discussed in Chapter 1 of this volume.

Surgical chisels. Surgical chisels may also be classified as cutting instruments. Like surgical burs, chisels are used to remove bone. They are also used to split teeth and are designed to be used with a mallet. Their cutting edges are easily dulled; therefore, you must sharpen them after each use, because sharp chisels reduce the trauma experienced by the patient. The chisels used in oral surgery and listed in the *Federal Supply Catalog* are the Stout #1, #2, and #3. Surgical chisels are much larger than the enamel chisels used in restorative dentistry. The #1 Stout chisel has the widest blade, and the #3 has the narrowest blade.

Curettes. While surgical curettes are not strictly cutting instruments, they must do some cutting in the performance of their function. Curettes are sharp, spoon-shaped instruments used to clean out infected cavities in bone and to remove debris from tooth sockets. They come in many sizes and in straight or angled shapes. The type used depends on the nature of the socket, curvature of the roots that were in the socket, and the location of the cavity in the mouth. The curettes usually stocked in most dental clinics are the Molt numbers 1, 2, and 4, which are straight curettes, and the Molt numbers 5L, 6R, 9L, and 10R, which are paired, angled curettes.

Exercises (412):

1. What names are usually used for surgical knives?

2. What should you do with a surgical knife blade after it has been used?

3. Which surgical knife blade or blades have:
   a. A hawkbill shape?

   b. A curved cutting edge?

   c. A straight cutting edge?

4. Which cutting instrument functions like large toenail clippers to snip off uneven bony projections?

5. What instrument is usually used after the Rongeur forceps has been used?

6. For what purposes are surgical chisels employed?

7. Which surgical chisel has the widest blade?

8. What cutting instruments are used to clean out infected cavities in bone and to remove debris from tooth sockets?

Elevators. Three different types of elevators are available for use in oral surgery procedures—the malar, periosteal, and root (see FO5). Two of these, the periosteal and root types, are further categorized by their various shapes. As the name implies, each of these elevators is designed to elevate something.

413. Identify the elevators used in the oral surgery section by class and use.

Malar elevator. As you recall, the facial bone that forms the cheek is called zygoma or malar bone. Traumatic injury of this bone often results in a depressed fracture. If this occurs, the bone must be elevated to its normal position. The malar elevator, which resembles a bent table knife, is used by the oral surgeon to lift or elevate a fractured zygoma.

Periosteal elevators. The fibrous membrane covering a bone is called the periosteum. The periosteal elevator is used to separate the periosteum and other tissues from the bone. It can also be used to separate the periosteum and gingival tissues from around impacted teeth, in areas where the bone needs trimming (alveolectomy), and also in areas where there are retained roots. There are three different periosteal elevators listed in the *Federal Supply Catalog:* the Molt #9, the Seldin #22, and the Seldin #23. The Molt #9 and the Seldin #22 are used exclusively as periosteal elevators, but the Seldin #23 has wide working ends and can also be used as a retractor.

Root elevators. Root elevators are available in more are a part of every tooth extraction setup. Which elevator or elevators are used depends upon the desire of the oral surgeon. Root elevators have three functions: to loosen the teeth in their sockets, to remove parts of teeth (broken root tips or retained roots), and sometimes to remove a complete tooth. In the last case, the tooth is usually an underdeveloped third molar. The elevators are actually levers. The fulcrum (support point) for the elevator is usually the support bone in which the tooth to be removed is located.

a. The elevators composing the straight working end group are the #301 and the #34S. The working ends are in line with the handle and have a concave surface. The #301 has the smallest working end, and the #34S has the largest working end.

b. There are two elevators with spade- or wedge-type working ends. They are the Stout A and the Cogswell A elevators. The greatest difference between these two elevators is in the handles. The Cogswell A handle is grooved, whereas the Stout A handle is plain.

c. The *Federal Supply Catalog* lists one pick-shaped root elevator, the Cogswell B, whose working end is shaped somewhat like a rounded toothpick tip.

d. In two sets of elevators, the handles are in line with the shank but the working ends are set at an angle. They are the Miller #73 and #74 set and the Seldin #1L and #1R set. The Miller #73 and #74 elevators have curved, thin, working ends with smooth, rounded tips. The Seldin #1L and #1R have very abrupt, sharp-tipped, working ends. The Seldins are sometimes referred to as "East-West" elevators.

e. One group of the elevators is designed to remove fractured root tips that are lodged deep in the tooth socket. These are frequently called root picks. Three elevators make up this group: the West #9, the West#9L, and the West #9R. The working ends on these elevators are very thin, sharply pointed, and small. The handles are also small in diameter but longer than those on the elevators we have considered thus far. The #9 has a straight working end and the working ends of the #9L and the #9R are set at left and right angles, respectively, to the handles.

f. The last group of elevators listed in the *Federal Supply Catalog* are commonly called Cross-Bar elevators. The handles are set at 90° in relation to the shank. This handle position allows the operator to exert great pressure. The Cross-Bar elevator group consists of two sets of paired elevators. The Winter #1L and the #1R set have working ends somewhat like the Miller #73 and #74, except that the Winter elevator working end tips are sharply pointed. Also, the Miller elevator working ends are more curved than those of the Winter #1L and #1R. The Winter #122 and #123 make a set and their working ends almost duplicate the Seldin #1L and #1R working ends.

Exercises (413):

Several elevators are pictured on foldout 8, exercise 413. Each is identified by a letter. Answer each of the following exercises by placing the appropriate letter from this foldout in the space provided.

____ 1. Which elevator is commonly referred to as the Cross-Bar elevator?

____ 2. Which elevator belongs to a group called the root picks?

____ 3. Select the two elevators that are classified as periosteal elevators?

____ 4. Which elevator belongs to a set that is referred to as the East-West elevators?

____ 5. Which elevator is classified as a straight elevator?

____ 6. Which elevator would be used to elevate a depressed zygoma?

Miscellaneous Surgical Instruments. In addition to the instruments we have discussed, there are some others needed in the oral surgery section. Among these are the aspirating, irrigating, suturing, and retracting instruments, and the surgical mallets. Our discussion begins with aspirating instruments. Refer to foldout 5 as we discuss these instruments.

414. Describe the miscellaneous instruments used in the oral surgery section by features, type, and function.

Dental aspirator. The dental aspirator itself is not an instrument but is classified as an item of equipment. We mention it here because there are parts of it that are usually considered as surgical instruments. These parts are the nose, handle, and tips. The hose used to connect the handle to the aspirator is simply latex rubber tubing, and is usually from 30 to 36 inches in length. The handle has a bulbous portion on one end and a chuck on the other end. The bulbous portion is slipped into one end of the hose, and the chuck ends holds the tips. There are two tips available—#2, and #4. The #2 tip is smaller and is suitable for use in a tooth socket. When these parts are properly joined and the loose end of the hose is connected to the aspirator, they function as a single suction unit. Your job is to connect the parts, operate the aspirator, and manipulate the handle and tip. With experience, you should be able to perform these tasks quickly and efficiently to keep the surgical site clear for the oral surgeon.

Irrigating syringes. There are two types of syringes for irrigating the oral cavity. One is the bulb-type syringe. It is a rubber bulb with a small tube extension and a metal tip, which fits into the tube on the bulb. The other syringe (Luer type) is composed of a glass barrel and a glass piston. The barrel portion is fully open at one end with a constricted opening at the other end. The glass piston has a handle on one end, while the remaining part acts as a plunger in the barrel. Irrigating syringes are used to flush pus and debris from tooth sockets and bone cavities, and from under inflamed gingival flaps (pericoronitis). They are also used to direct sterile water onto a surgical bur to flush bone chips and blood from the dentist's field of vision.

Surgical mallets. Basically, all mallet are designed to produce a hammering type of action. The oral surgery mallet is no exception. It is a small hand type that resembles a gavel. It is used in oral surgery with the surgical chisels. The mallet along with the selected chisel is used to split teeth or reduce alveolar bone.

Suture needles. Most suture needles used by the oral surgeon are semicircular. These needles are available with either smooth sides or cutting sides. They vary greatly as to the diameter of the semicircle. The smaller sizes are most often used in oral surgery because of the limited space in the oral cavity. Some needles are already attached to the sutures and arrive in sterile vials or foil packets. Others are available separately.

Suture materials. Suture materials are usually classified as either absorbable or nonabsorbable. Almost all sutures used in oral surgery are nonabsorbable. Absorbable sutures are dissolved and absorbed in the body. Examples of absorbable sutures are the "catgut" (made from sheep's intestine) and "tendon" types. Many materials are used to make nonabsorbable sutures. Some of these are silk, cotton, nylon, and even corrosion-resistant steel wire. Probably the most common suture used in oral surgery is made of silk. All of these sutures are available in different diameters. The oral surgeon uses the suture material with a suture needle to close wounds in the oral cavity. Since almost all of the suture material is nonabsorbable, these sutures must be removed after the wound heals enough to hold together.

Tissue retractors. As the name implies, tissue retractors are used to retract tissue. In oral surgery they are used to hold tissue flaps away from the operative site to provide better visibility. These retractors have forklike prongs, which permit handling the tissue without causing excessive damage.

Exercises (414):

1. Which of the two aspirator tips is the larger?

2. Name the two types of irrigating syringes.

3. What surgical instruments are used to flush pus and debris from tooth sockets and bone cavities, or from under inflamed gingival flaps; and are also used to direct sterile water onto a surgical bur during tooth-sectioning procedures?

4. What surgical instrument is often used with surgical chisels to split teeth or reduce alveolar bone?

5. What is the usual shape of the surgical needles used in oral surgery?

6. Give the most common type of oral surgery suture material.

7. Describe the working end of a tissue retractor.

3-2. Periodontal Instruments

When you break down the word "periodontal," you have an insight into the general purpose of these instruments. Periodontal instruments are not designed to be used on or in teeth but are used around the teeth. To be a little more specific, periodontal instruments are designed primarily to treat the structures surrounding the teeth. You may remember from your study of the preceding volume that the greatest cause of tooth loss is periodontal disease. Thus, it is an understatement to say that periodontal instruments are very important. The periodontal instrument group includes scalers, files, curettes, probes, hoes, pocket-marking forceps, and knives.

415. Identify by features, type, and function the scaling instruments used to prevent or treat periodontal disease.

Scalers. It has long been the practice of the medical and dental professions to follow a pattern in rendering treatment. First, the signs and symptoms concerning the patient are evaluated to form a diagnosis. With the diagnosis established, treatment begins, if needed. A principle commonly applied to any treatment series is to remove the irritant that causes the disease or condition. One common source of irritation to periodontal structures is calculus. Calculus is a hard, calcified substance composed of calcium carbonate, calcium phosphate, and organic matter. This calculus is found on the exposed crown parts of teeth and often extends beneath the gum tissues. The texture of calculus is generally rough. Scalers are used to remove calculus found on the root and crown portions of the teeth. Refer to foldout 5 as we discuss these scalers.

Fixed-tip scalers. Although preventive dentistry technicians normally scale teeth, you may be assigned where there aren't any preventive dentistry technicians. In such a case, you may be called upon to scale teeth under the supervision of a dental officer. This requirement makes it necessary that you be familiar with fixed-tip scalers.

a. The Zerfing scaler functions when used with a push-type motion. This scaler has a single cutting edge and is used to remove calculus from between anterior teeth. Since the Zerfing scaler is difficult to control, only experienced personnel should be permitted to use it. As is the case with most scalers, careless use can severely lacerate oral soft tissues. This is especially true with the Zerfing scaler. For this reason, you should refrain from using it until you have become skilled in using the other scalers we shall mention. You should also establish a finger rest or "fulcrum" before attempting to use any scaler. Be sure to use a finger on the same hand holding the instrument to establish a support point. This support point can be anywhere on a tooth or teeth but should always be on the arch you are treating.

b. The Younger-Good #15 and B-scalers are sickle-shaped. They are designed for primary use in anterior teeth areas. They are also effective on the facial, lingual, and interproximal surfaces. Use the Younger-Good #15, and the B-scalers with a pull-type motion.

c. The Jacquette scalers are among those most common in the dental clinic. There are three of them, numbered 1, 2, and 3. The #1 Jacquette scaler is used on anterior teeth, while the #2 and #3 are used on posterior teeth. The Jacquette #2 is for scaling the maxillary right facial, the maxillary left lingual, the mandibular left facial, and the mandibular right lingual surfaces. The Jacquette #3 scaler is used in scaling the remaining posterior teeth areas. Thus, the three Jacquette scalers may be used in combination to scale the entire dentition (full set of teeth).

Morse scalers. Morse scalers are a set of scaler points used with a separate chuck-type handle. The *Federal Supply Catalog* lists the handle as a "Dental Instrument Point Handle" and the Morse scalers as "Dental Scaler Points." There are six different points, which are numbered 2, 3, 4, 5, 6, and 7:

a. Morse scaler point #2 is a small hook which resembles the Younger-Good #15. The #2 is used to scale anterior teeth.

b. The Morse #3 point is a modified hook-type similar to the Jacquette #1 scaler. The #3 point is also used to scale anterior teeth.

c. Morse point #4 is similar to Jacquette scaler #3 and is used in the same posterior areas of the mouth.

d. The #5 Morse scaler point resembles the #2 Jacquette scaler and is used on the same posterior teeth.

e. The Morse #6 has a sickle-shaped point. It is a modified version of the B-scaler. Use the #6 point on anterior teeth.

f. Morse scaler point #7 is another sickle-shaped instrument. It more closely resembles the B-scaler than the #6 point. The #7 point is also designed for use on anterior teeth.

There is still a third set of instruments used to scale teeth. This third set is the ultrasonic handpiece insert set.

Ultrasonic handpiece inserts. The ultrasonic handpiece inserts are used in conjunction with the ultrasonic prophylaxis unit, which converts

209

electrical energy into sound waves. There are three essential parts involved—the unit, the handpiece, and the handpiece insert. The unit transmits electrical energy to the handpiece. The handpiece insert then converts the electrical energy into sound waves or vibrations at the insert tip. These vibrations move the insert tips 1/1000 inch. When properly tuned, the tip vibrates from 20,000 to 25,000 times per minute. The vibrating tip action is very effective in removing calculus. To prevent overheating the insert, a small stream of water continually flows onto the tip. You must adjust the water flow until a fine mist (with a few droplets) is emitted from the tip. There are eight different handpiece inserts listed in the *Federal Supply Catalog*. They are the curette type, the flat-hoe chisel type, the left hatchet type, the right hatchet type, the left Jacquette type, the right Jacquette type, the small universal hook type, and the straight scaler type.

Exercises (415):

Foldout 8, exercise 415, shows several scaling instruments. Each is identified by a letter. Answer each of the following questions by placing the appropriate letter in the space provided.

____ 1. Which scaler is used only with a push-type motion?

____ 2. What are the two scalers primarily designed to scale posterior teeth?
____

____ 3. What are the three sickle-shaped scalers designed for scaling anterior teeth?
____
____

____ 4. Which instrument functions through a vibrating action?
____

____ 5. What three instruments compose the Jacquette scalers?
____
____

____ 6. Which instrument is the Zerfing scaler?

____ 7. Identify in this order the "B" scaler, and the Younger-Good #15.
____

416. Identify by class and function the instruments used in treating subgingival preiodontal conditions.

Periodontal Curettes. We have already described one type of curette, the surgical type. Surgical curettes and periodontal curettes are similar in name only. Periodontal curettes are different in size and shape and are designed for different purposes. Periodontal curettes are more closely related to scalers than to any other instrument. They are, in fact, used to remove calculus just as scalers are, but the main difference between the scalers and the periodontal curettes is in the areas in which they are used. While scalers are used to remove calculus mainly on the exposed crown parts of the teeth, the periodontal curettes are used primarily to remove deposits of subgingival (below the gum line) calculus. A number of investigations have shown that periodontal curettes are less traumatic to the hard structures, cementum, and supporting structures of the teeth than scalers. The *Federal Supply Catalog* lists the Gracey and McCall curettes. The Graceys listed are #1 through #14. The McCalls listed are #13S-#14S and #17S-#18S. Some commonly used Gracey curettes are #3, #4, #11, and #12. See foldout 6 for Gracey and McCall curettes and the other periodontal instruments:

a. The Gracey #3 and #4 curettes are single-ended instruments that together make a pair. You use these curettes on anterior teeth.

b. The Gracey #11 and #12 are also single-ended instruments that together make a second pair of curettes. Since #11 and #12 Graceys are designed for use in all areas of the mouth, they are called the universal curettes.

c. The McCall #13S-#14S is a double-ended curette. Use this instrument for scaling bicuspid teeth.

d. The McCall #17S-#18S is a second double-ended curette, specially designed for scaling molar teeth.

Periodontal Hoes. Periodontal hoes are used to remove subgingival calculus. Their working ends have small projections, which form the cutting edges. The cutting edge appears to be perpendicular to the shank, but the cutting edge on the periodontal hoe is actually placed at somewhere close to a 45° angle from the shank of the instrument. There are four periodontal hoes listed in the *Federal Supply Catalog*—Orban types #5, #6, #7, and #8.

Periodontal Files. Periodontal files are instruments used to smooth roughened root surfaces. There are four periodontal files in the Air Force inventory: the Orban numbers 9, 10, 11, and 12. The Orban files have flat, wide, rounded working ends. The Orban #9 and #10 are a set of paired periodontal files that are used to smooth roughened cementum on mesial and distal root surfaces. The Orban #11 and #12 compose a set that is used on the facial and lingual root surfaces of posterior teeth. Let's consider next a noncutting type of periodontal instrument—the periodontal probe.

Periodontal Probes. Periodontal probes are used to determine accurately the presence, depth, and form of periodontal pockets. An angled shank places the working end at about a 45° angle in relation to the handle. The thin, narrow working end is easily inserted to the depth of the periodontal pocket. These working ends are scored at millimeter intervals. The scored marks make it easy to determine the depth of the pocket. Some probes have a mark for every millimeter from 1 through 10. Others have a mark for every millimeter from 1 through 3, then marks for every 2 millimeters from 3 through 7, and finally marks for every millimeter from 7 through 10. The *Federal Supply Catalog* lists the Fox and Merritt "B" periodontal probes. Both of these probes have scored marks as in the description above. The Fox and Merritt "B" probes appear much alike, except that the Merritt "B" has a round working end while the Fox has a flat working end.

Periodontal Pocket-Marking Forceps. The periodontal pocket-marking forceps are listed in the *Federal Supply Catalog* as the Goldman-Fox #1, and the Goldman-Fox #2. At first glance, periodontal pocket-marking forceps appear to be dressing forceps. When you examine the working ends, however, you can see that one tip has a perpendicular blade projection. They are used to mark the depth of periodontal pockets so that the mark is visible on the exposed gingiva before periodontal surgery. The smooth tip is inserted between the tooth and gums to the bottom of the periodontal pocket, and the instrument ends are then closed. This causes the tip with the blade to perforate (penetrate) the gingival tissue. Several of these perforations provide the operator with a reference line for the excision of excess gingival tissue and the elimination of periodontal pockets. The final family of periodontal instruments is the periodontal knives.

Periodontal Knives. The periodontist uses periodontal knives to remove gingival tissue (gingivectomy) during periodontal treatment. There are several knives manufactured for this purpose. They are the Kirkland #K-15; the Kirkland #K-16; and the Orban knives #19, #20, #21, and #22. The Kirkland knives are used to make the initial incisions, and the Orban knives are used to complete the dissecting procedure.

Exercises (416):

Foldout 8, exercise 416, shows several periodontal instruments. Each is identified by a letter. Complete each exercise by placing the appropriate letter in the space provided.

____ 1. Which instrument is designed to remove gingival tissue (gingivectomy)?

____ 2. Which instrument perforates gingival tissues to provide a reference line for the excision of excess gingival tissue?

____ 3. Identify the three instruments that are designed to removed subgingival calculus deposits.
____
____

____ 4. Which instrument can accurately determine the presence, depth, and form of periodontal pockets?

____ 5. Which instrument is used to smooth roughened cementum on root surfaces?

____ 6. Which instrument is a periodontal hoe?

____ 7. Which instrument is an Orban file?

____ 8. Identify the two periodontal curettes.
____

____ 9. Which instrument is a periodontal knife?

____ 10. Which instrument is the pocket-marking forceps?

____ 11. Which instrument is the periodontal hoe?

____ 12. Which instrument is the periodontal probe?

3-3. Endodontic Instruments

If the pulp of a tooth has become necrotic (dead), endodontic treatment may be considered. Endodontics is described as root canal therapy. It includes removing the tooth pulp, sterilizing the root canal, and filling the root canal with a root canal filling material. Endodontics is sometimes performed in conjunction with the surgical removal of the tooth root apex and the surrounding infectious debris; this procedure is called an apicoectomy. The instruments specifically designed for root canal procedures are called endodontic instruments. They include root canal broaches, reamers, files, and pluggers. Refer to foldout 6 as we discuss these instruments.

417. Describe the instruments used for endodontic procedures by function, features, and type.

Root Canal Broaches. A root canal broach is one of the first instruments used in the pulp canal during endodontic treatment procedures. Before broaches are used, however, the dental officer uses a bur to gain entrance into the pulp chamber. Broaches are then used to clear the canal of soft tissues. These broaches are shaped like needles covered with small barbed projections. The *Federal Supply Catalog* lists three sizes—coarse, fine, and extra fine. The usual procedure is to start with the smallest broach. The chunk-type handle, called a broach holder, helps to control the broach during use. Discard each broach after it has been used.

Root Canal Reamers. Root canal reamers are used to enlarge the pulp canal after the broaches have been used. The reamers are available with either short or long handles. They are also available in many sizes. The *Federal Supply Catalog* list begins with size 10 and continues in intervals of 5 to size 60. Beginning with size 60, they are also available in intervals of 10 through size 100. The working ends on reamers look like a needle with screwlike graduated threads. The dental officer may use several reamers in one operation. He usually begins with a relatively small size, then uses the next larger size each time, until the canal has been reamed to the desired diameter.

Root Canal Files. Root canal files are used to smooth the root canal following the use of the reamers. The working ends of the files look much like those of the reamers. The difference is in the threaded part. The file threads are much finer and closer together. Like the reamers, the files are available with either a long or a short handle and in the same sizes. Files are also available in two other sets called the Hedstrom files. Both of the Hedstrom file sets, like the regular files and reamers, are in sizes beginning with size 15 and continuing through size 100. The difference between the two sets is in the length of their working ends. The working ends of one set are 21 mm long, and the ends of the other are 25 mm long.

Root Canal Pluggers. Root canal pluggers are used to pack root canal filling materials into prepared root canals. The working ends of these pluggers are cylinder-shaped with flat tips. There are two different types available. One type has contra-angled working ends, whereas the other has straight working ends. The contra-angled types are numbers 7, 9, and 11, with number 7 the smallest. Numbers 1, 3, and 5 make up the straight working end type. The contra-angled types are convenient for bicuspid teeth, and the straight types are suitable for anterior teeth. Another instrument, sometimes considered a root canal plugger, is the gutta-percha spreader #3. The spreader has a contra-angled point.

Endodontic Explorers. In addition to the other endodontic instruments, there are two explorers that have been designed especially for endodontic purposes: the #DG16A and #16B. The endodontic explorers have long, narrow working ends, angled from their shank in such a way that they provide easy access to the pulp canal. The endodontic explorers are used for the exploration and debridement of pulp chambers and canals.

Exercises (417):

1. Which endodontic instrument is used to clear the pulp canal of soft tissues?

2. Which endodontic instrument is used to enlarge the pulp canal?

3. What endodontic instrument is used, after the reamers, to smooth the root canal?

4. How do the threads of the files and the reamers differ?

5. Describe the two types of root canal pluggers.

3-4. Prosthodontic Instruments

A prosthodontic appliance is a replacement for a missing portion of the normal dentition. Full dentures, removable partial dentures, fixed partial dentures (bridges), and crowns are prosthodontic appliances. The instruments used by the dental officer in the prosthodontic treatment rooms are those we are going to discuss. Prosthodontic instruments, in the true sense, include all the instruments used to fabricate dental appliances. Some prosthodontic instruments are used only in the dental laboratory. Others are used only in the prosthodontic treatment room. Still others are used in both places. You, as the chairside assistant, are primarily concerned with the instruments used in the prosthodontic treatment room. This group includes impression trays, spatulas, mixing bowls, knives, pliers, scissors, the alcohol torch, the crown remover, and the roach carver. Refer to foldout 7 as we discuss these instruments.

418. Answer key questions about the instruments used in the prosthodontic section.

Impression Trays. Impression trays hold impression materials to obtain a negative reproduction. The impression may include a portion of the arch or the entire arch. The tray holds the impression material in place while it sets or becomes elastic. Generally, the impression tray is shaped to match the natural contour of the arch. They are available in many sizes for both the maxillary and mandibular arches. The trays used for making mandibular impressions are easily distinguished from the maxillary tray by the area left open for free tongue movement. Impression trays can be further divided into two groups, as they are found in the *Federal Supply Catalog*—those made of aluminum and those made of brass.

Aluminum impression trays. The aluminum impression tray group is used for making edentulous (without teeth) arch impressions. (See FO 7.) Your responsibility with aluminum trays is to keep them clean and to learn the ones your dental officer prefers. In this way, you can anticipate his needs and be more effective as a chairside assistant.

Brass impression trays. Brass impression trays do not appear to be made of brass because they are plated with a nickel-colored metal. These trays are easily identified, however, by their rim-locking characteristic. This rim resembles a metal wire soldered along the inner part of the tray at the edge of the outer borders. Also, the maxillary brass impression tray has a U-shaped wire soldered to the palatal area of the tray. These trays are called rim-lock impression trays. Semiliquid impression material flows into the undercuts (ledges) formed by the rim and sets (hardens); this locks the material in the tray. The dental officer can then remove the impression without fear of separating the impression material from the tray. Rim-lock trays are used for hydrocolloid impression materials.

Prosthodontic Spatulas. Spatulas are used in prosthodontics for handling dental waxes and mixing impression materials. The spatula used to mix the various impression materials is called a laboratory spatula. It has a 2 1/2-inch flexible blade, which is about 1 inch wide with a rounded end. The handle is usually made of wood or plastic. The wax spatulas commonly used are the Beale #7 and the Gritman #31. The #7 spatula is much shorter and has small, spoon-shaped, double working ends for detailed wax work. The #31 spatula is also double-ended with one large rounded, spoon-shaped end and one large sharp-pointed, spoon-shaped end. Spatula #31 is used on the less delicate wax work where detail is not a requirement. Both wax spatulas are used to hold small bits of wax over a Bunsen burner flame. Once the wax melts, it may then be flowed onto an occlusion rim or perhaps added to a wax denture base. At times, wax spatulas are simply heated over a flame and used while they are still hot to smooth or adjust wax patterns, occlusion rims, and baseplates.

Mixing Bowl. The item needed to hold alginate-type impression material and water for mixing is the mixing bowl. This flexible bowl is made from either rubber or flexible plastic, and available in small, medium, large, and extra large sizes. All sizes are used in the dental laboratory, but the one often used in the prosthodontic treatment room is the medium size. The spatula used to incorporate the powdered alginate into the water is normally the 2 1/2-inch blade spatula we mentioned earlier. You may also find that a regular, dining-hall, table knife is used as a mixing spatula. In either case, the rounded ends on the spatula or the table knife pretty well match the contour of the mixing bowl.

Prosthodontic Knives. Usually two kinds of knives are used in the prosthodontic treatment room: the compound knife and the plaster knife. As the names imply, one is used with compound, and the other is used with plaster.

Compound knife. The compound knife has a fairly large red plastic handle and detachable blades. Routinely, the #25 blade is used to trim impression compound, wax, and other materials that require an extremely sharp cutting edge. This blade is almost identical to a larger version of the #11 surgical blade we talked about earlier. Your primary concern with the compound knife is to replace broken or dull blades.

Plaster knife. The plaster knife is a heavy-duty model used to trim and chisel plaster of paris and impression compound. It has a large flat blade at one end with a wide, screwdriver-appearing projection at the other end. The handle is made of wood and riveted in place. You must keep the blade of this knife sharpened.

Dental Pliers. Dental pliers have several functions. Those listed in the *Federal Supply Catalog* include the pin amalgam type, the matrix type, and several others designed for use in the prosthodontic section. Some of the more common ones found there are the clasp bending, contouring, and clasp adjusting types. This group generally includes, but is not limited to, pliers #47, #122, #134, #137, and #200. This group provides the prosthodontist with a variety of working jaw shapes for adjusting, bending, and contouring prosthodontic appliances. Once again, your responsibility is to identify the pliers by function and learn which pliers the dental officer prefers. If you do these things, you will have the desired instrument available when it is needed.

Collar and Crown Scissors. The primary use of the collar and crown scissors in the prosthodontic section is shaping copper bands. These same scissors are used in restorative dentistry to cut and contour matrix bands. Collar and crown scissors are listed in three different types—the straight universal, the Beebee curved, and the Quimby curved. All of these are heavy-duty scissors because they must cut the metal matrix bands and strips as well as copper bands. These scissors are fairly maintenance free. They measure from 4¹/₄ to 4³/₄ inches in length.

Alcohol Blowtorch. The alcohol blowtorch is designed to provide directional control of an alcohol flame. Basically, it is a small alcohol burner (wick type) with a hand pump that operates a bellows. The bellows forces air through a small air jet on top of the blowtorch. The air jet is set to direct the air across the flame. This design allows the prosthodontist to direct the flame in any direction. The alcohol blowtorch is frequently used to partially melt and smooth roughened wax on denture wax-ups and to soften baseplates for adapting to stone models. Your duties with the blowtorch are to keep it free of wax and to keep the fuel reservoir filled with the proper fuel.

The proper fuel for the alcohol blowtorch is, as the name indicates, alcohol. However, not just any alcohol will do. For example, dental clinics frequently use isopropyl alcohol as a disinfectant. Used as a disinfectant, isopropyl alcohol is in a solution, containing about 70 percent alcohol and 30 percent distilled water by volume. The diluted alcohol produces a flame of very poor quality. Further, 100 percent isopropyl alcohol tends to smoke badly while burning, which makes it somewhat undesirable as a blowtorch fuel. Ethyl alcohol produces a clear blue flame but is undesirable because it is a security item. Also the denatured and rubbing alcohol types are unsuitable as fuels. The best fuel choice for the alcohol blowtorch is methyl (wood) alcohol. Methyl alcohol is highly poisonous if taken internally. It burns with a reddish-yellow flame, which is not as hot as the ethyl alcohol flame, but is hot enough for use in the prosthodontic section.

Crown Remover. At times, the dental officer must remove a gold crown from a tooth to gain access to a dental problem. This can present quite a problem if the necessary instrument is not available. In fact, it is next to impossible to remove some gold crowns without a crown remover instrument. The handle on a crown remover is encircled with a heavy steel weight which slides from one end of the handle to the other. Two interchangeable points make up the working end. One of these points is contra-angled and the other is straight. Both points have a right angle projection at the tip. When the crown remover is used properly, the tip is placed over the margin or junction of the crown and tooth first. Then the sliding weight on the handle is tapped against the bottom part of the handle. Usually, one or two taps of the sliding handle are all that is needed to separate the crown from the tooth.

Roach Carver. The roach carver is a double-ended instrument used to cut, smooth, and carve dental waxes. At first glance, it appears to be a wax spatula. A closer examination reveals a spear-shaped blade at one end with a deep-welled, very small spoon at the other end. Both ends have very sharp edges.

Exercises (418):

1. Which type of impression tray is usually used for the impression of an edentulous arch?
2. Which prosthodontic knife has a fairly large, red plastic handle and uses detachable blades?
3. Which prosthodontic instrument has a heavy steel weight that slides up and down its handle?
4. What is the best fuel choice for the alcohol blowtorch?
5. What double-ended prosthodontic instrument is used to cut, smooth, and carve dental waxes?
6. Which prosthodontic instrument is used for clasp bending, contouring, or adjusting?

7. Which prosthodontic spatulas are used with dental waxes?

8. In addition to a spatula, what other equipment item is required in mixing alginate-type impression material?

9. What prosthodontic item is used for the shaping of copper bands?

10. What is another name for the brass impression trays?

CHAPTER 4

Dental Materials

THE SUCCESS OF dental procedures depends upon many people, one of whom is you. Starting at the manufacturing plant, several people are involved in the production of dental materials. From the manufacturer, some of these materials enter the Federal supply system and eventually end up in the dental clinic where you are assigned. There, the responsibility for using a portion of these materials rests upon you and the dental officer you assist. While the dental officer has the overall responsibility, he does depend directly upon you to properly prepare filling materials for insertion in a patient's tooth. The dental officer looks upon you as his semiprofessional assistant. He expects you to have the knowledge and ability to proportion, mix, and sometimes help insert the mix in the prepared tooth. A blunder in any one of these steps can mean the failure of the restoration.

The dental materials found in Air Force dental clinics are supplied by many manufacturing firms. Each of these materials has been through many quality control inspections to assure that it is of high quality. The standards that these materials must meet are established by the American Dental Association and Federal Government specifications. Thus, we can be reasonably sure that the dental materials arrive in Air Force dental clinics as high-quality products.

Although dental materials arrive as high-quality products, they are of little or no value unless they are handled properly. One way to handle dental materials *improperly* is to mix part of one material from a certain *lot* number with a like material with a different *lot* number. We can compare this problem with a similar problem encountered with paint. Two cans of paint may have the same brand name, the same ingredients, and the same color listed on the label, but have different lot or batch numbers. The professional painter knows that it is next to impossible to obtain an exact color match. Further, there may be slight differences in the ingredient percentages that affect the drying (setting) time and the resultant texture. This same principle applies to intermixing dental materials that are alike except for having different lot numbers.

Another way to improperly handle a dental material is to proportion and mix the material without first reading and heeding the manufacturer's instructions. We generally conclude that the manufacturer knows his material best. Along with each unit (package, box, etc.), the manufacturer sends a small brochure that briefly and basically explains the dental material. This brochure provides information on the uses, mixing procedures, mixing time, setting time, and handling characteristics of the material involved. Therefore, it is important that you read and follow the manufacturer's instructions. We will begin our discussion of dental materials with dental amalgam.

4-1. Dental Amalgam

Dental amalgam is the most widely used restorative material. It is our best filling material for many restorative procedures. To achieve the best possible results, the assistant must know how to mix and handle amalgam properly. Every step in the handling of amalgam, from the proportioning of alloy and mercury to the final polishing of the restoration, has some effect upon its properties. Often, while an amalgam meets the American Dental Association specifications, it results in a very poor filling because of some faulty technique in mixing. You must try, therefore, to set up a standard method of working with amalgam to eliminate any variation in any step of the manipulation.

419. Given a series of statements concerning the uses, characteristics, components, and properties of dental amalgam, indicate which are true and which are false.

Uses. Basically, dental amalgam has two uses. It is sometimes used as a die material. (In dentistry, a die is a positive reproduction of a tooth prepared to receive a restoration.) More often, however, dental amalgam is used as a restorative material. Usually, amalgam is used to restore posterior teeth because its characteristic color makes it esthetically undesirable in anterior teeth.

209

Characteristics. The word "amalgam," as it is used in dentistry, is defined as a combination of mercury with other metals. In contrast, the average dental patient refers to dental amalgam as a "silver filling." Although silver is one ingredient and an amalgam restoration does reveal a silver-gray colored filling, the dental amalgam is a true amalgam, and is a combination of mercury with other metals.

The mercury is supplied as a separate item, but the other metals arrive combined as a single alloy in the form of pellets. This alloy is frequently referred to as "silver alloy." Each component of dental amalgam is very important, so we should consider them further.

Components. In addition to the mercury already mentioned, the other metals that make up dental amalgam are silver, tin, copper, and zinc. Each of these five metals contributes certain qualities or values to the combined amalgam. That is to say, when all five metals are combined, each reacts *chemically* to produce a certain reaction or effect. Let's examine each metal and see how each affects the final product.

Mercury. Mercury is a metal in liquid form at room temperature. When mercury is placed in contact with certain other metals, it acts to bond or adhere to the other metals. An example of this action is seen when mercury is placed on a silver coin. In the similar way, mercury reacts chemically with the particles of silver in the alloy to bond the particles together. To help speed up this chemical action, the alloy and mercury are usually placed in a capsule and mechanically triturated (mixed or thrown together). Mixing the amalgam will be discussed in more detail later. For now, we will turn to some precautions involved in handling mercury.

Mercury left uncovered at room temperature volatilizes (converts into vapor) into the air. Since mercury vapors can be a health hazard, you should continually observe the following practices:

- Store mercury in a closed container.
- Always sweep up spilled mercury with a broom and never with a vacuum cleaner unless it is one especially designed for mercury pickup. Household vacuum cleaners increase mercury volatilization.
- Discard the spilled mercury in the scrap amalgam container.
- Store unused portions (scrap) of dental amalgam in a vessel containing enough water to cover the amalgam.

Notice that the label on a bottle of mercury shows the contents to be poisonous. Naturally, mercury in its pure state is harmful, but the mercury found in medicinal compounds and in dental amalgam is not harmful when properly applied. The next metal, silver, makes up the highest percentage of the alloy that is mixed with mercury.

Silver. The American Dental Association (ADA) has established either the maximum or the minimum percentage for each of the metals found in dental amalgam alloy. For silver, the ADA has specified a *minimum* of 65 percent. Silver provides strength, durability, and color to dental amalgam. In addition, silver gives amalgam a desirable setting expansion, decreases flow, and decreases the setting time.

Tin. Tin is a soft metal that is highly malleable (can be hammered into a metal sheet) and ductile (can be drawn into a wire) at ordinary temperatures. For tin, the ADA has determined 29 percent to be the *maximum* amount allowed. The softness quality of tin makes the amalgam more workable. Tin also combines easily with the mercury. Further, tin helps control expansion and increases both the flow and setting time of the amalgam.

Copper. The ADA specifies 6 percent to be the *maximum* amount of copper permitted in dental amalgam alloy. The copper increases hardness and causes expansion of the amalgam during the setting process. Copper also reduces the flow and shortens the setting time.

Zinc. The last of the five metals is zinc. The *maximum* amount allowed in dental amalgam alloy is 2 percent. Zinc increases the workability of the amalgam and prevents the formation of oxides with the other metals.

You have noticed, no doubt, that the descriptions of the above metals reveal that the chemical action of one metal is often counteracted by the action of another metal. The resulting product is a restorative material with properties that meet the exacting requirements of modern dentistry.

Properties. The ideal restorative material is one that duplicates original tooth structures. Of course, modern science has been unable to accomplish such a feat to date. Dental amalgam, however, does possess many of the desirable qualities while having few undesirable ones.

Desirable properties. A properly proportioned and properly mixed amalgam has the following desirable properties:

- Is easily adapted to prepared cavity.
- Is dimensionally stable.
- Has adequate strength when set.
- Resists discoloration.
- Has suitable setting time.

Undesirable properties. As we stated earlier, there is no perfect filling material. The two main undesirable properties of dental amalgam are its high thermal conductivity and its poor color. Because of its high thermal conductivity, dental

210

amalgam restorations are often placed over an insulating base material that helps protect the tooth pulp from temperature change irritation. The metallic or silver-gray color of dental amalgam also makes it undesirable as a filling in anterior teeth. You can avoid adding other undesirable qualities by mixing the amalgam in correct proportions.

Exercises (419):

Indicate whether the following statements concerning dental amalgam are true (T) or false (F) by circling the appropriate T or F.

T F 1. Dental amalgam is best suited for anterior restorations.

T F 2. Dental amalgam is sometimes used as a die material.

T F 3. Silver alloy is usually supplied in pellet form.

T F 4. The word "amalgam" as it is used in dentistry is defined as a combination of mercury with other metals.

T F 5. Scrap amalgam should be stored in a dry open container.

T F 6. The best way to clean up spilled mercury is with a household vacuum cleaner.

T F 7. The ADA's allowable percentages for the metals comprising silver alloy are a minimum of 65 percent silver and a maximum of 29 percent tin, 6 percent copper, and 2 percent zinc.

T F 8. Tin functions in an amalgam restoration to prevent the formation of oxides with the other metals.

T F 9. The metal that provides strength, color, and durability to the amalgam is silver.

T F 10. Copper functions to increase the hardness, cause expansion, reduce the flow, and shorten the setting time of amalgam.

T F 11. The two major undesirable characteristics of amalgam are its high thermal conductivity and its poor color.

420. Explain specified procedures for mixing amalgam.

Mixing Amalgam. Normally, dental amalgam is easily prepared. Very little equipment and time are needed to produce a satisfactory restoration. However, you must follow certain steps and precautions to produce desired results.

Alloy/mercury proportioning. The first step in preparing a mixture of amalgam is proportioning the alloy and the mercury, and the first step in proportioning dental amalgam is to make sure you understand the manufacturer's instructions. Each alloy manufacturer provides a brochure that gives the alloy composition, degree of coarseness, mixing time, and alloy-mercury ratio. It is important that you follow the manufacturer's instructions exactly.

In addition to knowing the alloy-mercury ratio, you must also know how much to mix. Since Air Force dental clinics use the pellet type of silver alloy, the amount to be mixed is stated in numbers of pellets. You may be asked to mix a "2-pellet mix." This means that you should place 2 silver alloy pellets in the mixing capsule and add the amount of mercury the manufacturer recommends to reach the proper alloy-mercury ratio.

There are two methods of proportioning the mercury. In the "manual" method, because pellets are preformed in a set amount of silver alloy, you must measure the mercury by using an eyedropper and counting the drops. However, a faster and more accurate method is to use a mercury dispenser specially made for the purpose. This unit, shown in figure 4-1, comes with four interchangeable plungers, each of which dispenses a specific quantity of mercury when the plunger is depressed. You can vary the alloy-mercury ratio by interchanging the plungers. You operate the device by placing the required number of alloy pellets in the mixing vessel. Then you add mercury by

218

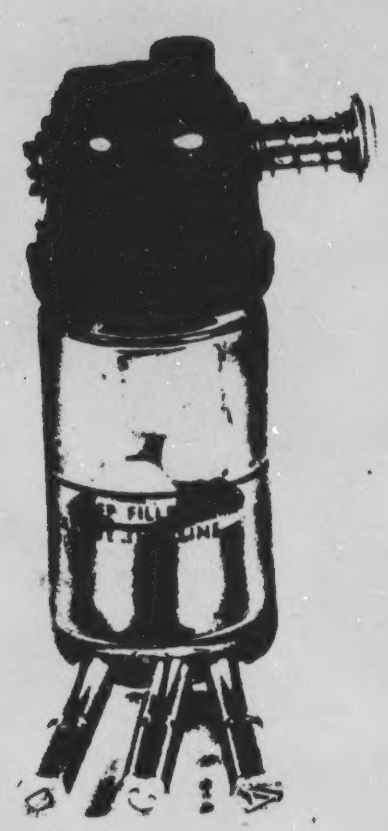


Figure 4-1. Mercury dispenser.

depressing the plunger on the mercury container. Be sure to use the plunger that produces the desired mix consistency.

Trituration. Now that you have proportioned the alloy and mercury, you must mix the two together. Mixing (triturating) amalgam can be done in two different ways. One way is the older method of manually using a mortar and pestle. The other method is using an electrical amalgamator that mixes the alloy and mercury mechanically. In the first method, you place the alloy and mercury in the mortar and mix them together by manually manipulating them with the pestle. The results are usually good in the hands of a skilled chairside assistant. But in the hands of the unskilled assistant, the mix is frequently undesirable because of variations in consistency and shortened working time.

The mechanical method is usually the better of the two because it eliminates the human variable and reduces the mixing time. Also, the mechanical method produces more consistent mixes from one mix to the next. The first step in the mechanical method is to inspect the capsule to make sure that it is clean and that it has a pestle (small plastic or metal cylinder that helps mix the amalgam). Place the alloy and mercury in the clean capsule along with the pestle. Now place the cap on the capsule and load the capsule between the forklike prongs on the electrical amalgamator. See figure 4-2. Set the mixing time as the manufacturer suggests and activate the amalgamator. The forklike mechanism vibrates the capsule at a very high speed to produce a smooth, homogeneous mix of amalgam.

The dental officer you assist may want you to mull the amalgam after mixing. To do this, remove the pestle. Replace the capsule on the amalgamator and operate the machine for 1 or 2 seconds. Another way you can mull the amalgam is to place it in a piece of rubber dam, a cotton squeeze cloth, or a fingerstall to protect it from moisture contamination from your fingers. Then knead the amalgam until it reaches the desired consistency. You use this latter method when you mix the amalgam manually.

After trituration and mulling, the amalgam may contain excess mercury. You remove this excess by squeezing. Place the mix in a squeeze cloth (a circular piece of white cotton cloth about 3 inches in diameter). Fold it over the mix and twist with finger pressure. The dental officer will tell you how much mercury to remove. Always squeeze the excess mercury into a container and never let it spill on the floor. As we mentioned earlier, the container should then be covered to avoid the volatilization of the mercury. After the excess mercury has been removed, the mix is ready for

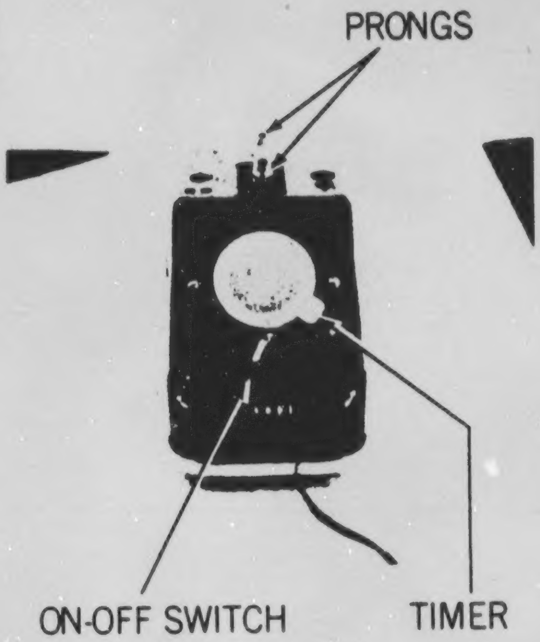


Figure 4-2. Amalgamator.

insertion into the cavity preparation. Open the squeeze cloth and load the amalgam carrier.

Packing the amalgam into the cavity preparation is known as *condensation*. Time and pressure are important factors in achieving the best results. The dentist must pack or condense the amalgam in the cavity preparation before the chemical setting action begins forming crystals. Therefore, it is important that you do not waste time in handling the amalgam after you have it. Too much delay can weaken the amalgam. As you may have already noticed, there are several areas where the wrong action can adversely affect the quality of an amalgam filling.

Exercises (420):

1. If the dentist calls for a "2-pellet mix," what should you place in the mixing capsule?

2. What is the purpose of the interchangeable plunger that comes with the mercury dispenser?

3. What term applies to mixing the alloy and mercury together?

4. Why is the amalgam that is mixed manually with a mortar and pestle frequently undesirable?

5. State the first step in the mechanical method of triturating amalgam.

6. Describe the process of mulling the amalgam with the amalgamator.

7. Why is the squeeze cloth used before loading the amalgam carriers?

8. What name applies to the process of packing the amalgam into the cavity preparation?

9. Why must you work rapidly with the amalgam after it has been mixed?

421. Point out specific procedures that insure an adequate quality control in dental amalgam preparation.

Quality Control Measures. To assure high-quality amalgam fillings, quality control measures must be continually applied. These control measures must begin with the development of the amalgam materials and end only after a missing part of a tooth has been successfully restored. Quality control measures may be divided along three lines of responsibility. The first control measures are the responsibility of the manufacturer; second, several control measures are in your hands; and finally, the dental officer himself is solely responsible for some of these quality control measures.

Manufacturer control measures. The manufacturer is responsible for the purity of the ingredients in his products. With reference to alloy specifically, the manufacturer must also exercise proper controls to produce an alloy with the metals in the correct proportions. We also depend upon the manufacturer to provide an alloy with the proper particle size. The particle size affects the consistency of the mix for a given alloy-mercury ratio. Still another process controlled by the manufacturer is the heat treatment given to the alloy metals. This is the controlled heating and cooling of the metals to bring out the best combination of the strength, condensing ability, and chemical bonding ability of the alloy.

Assistant control measures. Although the dental officer has the overall responsibility for any restoration, he depends upon you to exercise certain control measures in handling dental amalgam. Among these areas under your control are the proportioning, mixing, and manipulating of the amalgam.

a. Proportioning. Proportioning the amalgam can be vital to the success or failure of a filling. Especially is this true when there is too little mercury, which produces a "dry mix." If any portion of a mix is too dry, it should be replaced with a mix of proper consistency. You should never add mercury to a mix that is too dry. If 1 drop of mercury is added to a partially set mix of average size, the resulting compressive strength of the mix will be about one-tenth of its normal strength. After your dental officer has told you what mix consistency he wants, refer to the manufacturer's instructions to find the proportions that will produce the desired mix.

b. Mixing. Mixing the amalgam properly is also vital to producing a quality restoration. Some improper quality control measures are faulty timing, overtrituration, and undertrituration:

(1) Timing is important as it relates to the moment when the mixing process should begin. If you begin a mix too soon, the amalgam may begin

to set before it can be used. Ask the dental officer to notify you when he will be ready for the mix.

(2) Overtrituration is undesirable because it decreases the setting time and increases the shrinkage of the amalgam.

(3) Undertrituration is also undesirable because it increases the setting time, increases the expansion, and weakens the amalgam. Once again, to prevent overtrituration or undertrituration of amalgam, consult the manufacturer's instructions.

C. Manipulation errors. Your manipulation of amalgam, as the assistant, is important. If proper controls are not exercised, the results can be discomfort and inconvenience for the dental patient. The most common error in manipulating amalgam is contaminating the mix with moisture or other impurities. These contaminants are usually introduced during the mixing, mulling, or squeezing of the amalgam.

(1) *Moisture.* If moisture in any form contacts freshly triturated amalgam, the result can be painful and injurious to the dental patient. The undesirable effects are delayed and excessive expansion, lowered crushing strength, blister formation on the amalgam surface, and pain shortly after the filling is inserted. You can introduce moisture into amalgam by mulling it in a moist palm, touching or handling it with moist fingers, or triturating it at a temperature below the dewpoint (the temperature at which moisture from the atmosphere begins to form on an item). You can help control the introduction of moisture into amalgam by making sure that it does not directly touch your bare skin and that the temperature of the amalgam doesn't fall below the dewpoint.

(2) *Other contaminants.* These are any foreign materials that enter the amalgam. If soil from an unclean squeeze cloth or debris on an instrument is introduced into an amalgam, it can interfere with the chemical bonding action. Even a small fragment of amalgam lodged in a capsule can act as foreign matter. To remove a small fragment of lodged amalgam, place a few drops of mercury in the capsule and place it on the amalgamator for a few seconds. This process usually dislodges the fragment of amalgam and it can then be emptied with the rest of the contents. To prevent contaminating amalgam with foreign matter, make sure that you use only clean squeeze cloths, instruments, and capsules. As a further measure, you may store the alloy and mercury in covered containers to guard against dust contamination.

Dental officer control measures. The dental officer is solely responsible for condensing the amalgam. If he does not condense the amalgam enough, the results are an increase in expansion and a weakened amalgam. Further, the chemical setting action can be interrupted if the dental officer takes too long in condensing the amalgam. This interference also weakens the amalgam. We mention these possible problems in condensing amalgam only because the dental officer condenses the amalgam that you prepare. Therefore, condensing problems encountered by the dental officer are many times the result of improper action on your part. As you may have already concluded, teamwork is essential in handling dental amalgam.

Exercises (421):

1. Who is responsible for the purity of ingredients, correct proportions of metals, proper particle size, and the heat treatment of the silver alloy?

2. What should you do if your amalgam mixture is too dry? Why?

3. Why is overtrituration or undertrituration of an amalgam undesirable?

4. What is the most common error in manipulating amalgam?

5. List the undesirable effects caused by the moisture contamination of amalgam.

6. List three ways that moisture can be introduced into amalgam.

7. How can you eliminate small fragments of amalgam that have lodged in the capsule from a previous mix?

4-2. Silicate Cement

Silicate cement, like amalgam, is a tooth restorative material. However, this is about the only thing the two materials have in common. Amalgam is used to restore posterior teeth and silicate cement is primarily used to restore anterior teeth.

422. Specify the use, components, properties, and mixing and placement procedures involved with silicate cement.

Silicate cement is used to restore anterior teeth mainly because of its esthetic value (pleasing appearance). It is supplied in a variety of shades to match the tooth color of each patient. Many dentists now prefer composite filling materials over silicate cement, but silicate cement has certain anticariogenic properties that still make it the material of choice for many patients, particularly those with rampant caries. To achieve the best results with silicate cement, the mixing time and the mixing technique are very critical. Any variation from the established mixing time and mixing technique can produce an improper mix consistency, an improper shade match, and a weakened filling. First of all, we will describe the components of silicate cement.

Components. A powder and a liquid are mixed together to form silicate cement. The powder is supplied in a small bottle. The liquid arrives in a small ampule, which is heremetically sealed. Both the powder and the liquid, along with a dispensing bottle for the liquid, arrive packed together in a small box. The box label gives the Federal stock number, the shade of the powder, and the manufacturer's lot number.

Powder. The powder component of silicate cement is silica (the main constituent), alumina, and various fluxes, including fluorine. The powder is so finely ground that it resembles talcum powder. The manufacturer has very carefully produced these powders to assure precise shades. It is important, therefore, that you do not let foreign matter get into the powder. Even dust from the air can enter an uncovered bottle of powder and upset the delicate color balance. Certainly, unclean instruments or an unclean mixing surface would significantly affect the color of the mix. Be sure that you maintain the cleanliness of everything you use in handling silicate cement powder to avoid any color change.

Liquid. The primary ingredients of the liquid part of silicate cement are usually phosphoric acid and water. The percentage of each ingredient varies a little from brand to brand. Thus, it is important that you do not interchange the components of different brands. Ideally, the powder and liquid should be of the same lot number as well as of the same brand. It is also important that you keep the bottle closed, except when dispensing the liquid. If silicate cement liquid is exposed to a high-humidity atmosphere, it will absorb water. If it is exposed to low humidity, it will lose water. Excess water in the silicate cement liquid causes rapid setting, and a loss of water from the liquid causes slow setting. For the same reason (possible water content imbalance), you must not place the liquid on the mixing surface prematurely. Ask the dental officer to notify you when to begin mixing the materials.

It is a good idea to wipe the neck of the bottle containing the liquid every 2 or 3 days. Phosphoric acid crystals form around the neck of the bottle and can make the bottle cap fit improperly. A cap that fits improperly does not protect the liquid and can cause it to gain or lose water.

If silicate cement is supplied to you by different manufacturers, their dispensing bottles sometimes look much alike. Since these liquids must not be used interchangeably, you should store each powder and liquid set together to avoid mismatching the liquids and powders.

Combined Properties. As with all dental materials, silicate cement has some desirable qualities and some undesirable qualities. If you recall, amalgam has a number of desirable qualities and very few undesirable qualities. In comparison, silicate cement has very critical desirable qualities, but its undesirable qualities are just as critical.

Desirable properties. Silicate cement has some advantages over metallic restorative materials. The major desirable property of silicate cement is its natural appearance. As we said earlier, it is manufactured in many shades to match the shade of the tooth being restored. Silicate cement is also translucent (transmits light) to about the same degree as natural tooth enamel, which contributes to its natural appearance. As we mentioned earlier, one of silicate cement's most important properties is its anticariogenic action. The fluorine concentration in the average silicate cement powder is from 12 to 15 percent. The clinical significance of the fluorine is quite important because the fluorine passes from the silicate restoration to the tooth's enamel. As a result, there is a low incidence of recurrent caries at the margin of a silicate restoration. Since marginal caries are the most frequent cause of the failure of most dental restorative materials, silicate cement is notably superior from this standpoint. Another of its desirable properties is its very low rate of thermal conductivity. Silicate cement is also relatively easy to mix and can be manipulated more easily than metals and alloys.

Undesirable properties. Even though silicate cement is classified as a permanent filling material, it is one of the least permanent. It is brittle, it is soluble in mouth fluids, it has a low crushing strength, and it contracts somewhat upon setting. All of these undesirable properties reduce the life expectancy of a silicate cement filling and thereby limits its use.

Mixing Procedure. As we stated earlier, silicate cement is relatively easy to mix. There are, however, definite steps to be taken and definite time limits in the mixing procedure. These steps are preparing the equipment, preparing the materials, and using an approved mixing technique.

Equipment preparation. To mix silicate cement, you need the following items of equipment:

(1) A clean, cool, dry glass slab. This should be used only for mixing silicate cement. If the glass

slab becomes chipped or scratched, you should replace it.

(2) The #142 plastic spatula. Be sure that the spatula is clean and dry. Never use the metal spatulas (#313 and #324) for mixing silicate as they will stain the mix.

(3) The powder measuring stick. This is an optional item. It is about 4 inches long and is slightly larger than a pencil in diameter. At each end of the stick is a cup-shaped depression used to measure the volume of powder.

After you have the above items laid out for use, you may need to run cold water over the glass slab and spatula to cool them to between 65° and 75° F. CAUTION: *Be sure you don't cool them below the dewpoint.* Next, you should dry them thoroughly, using a clean towel. You are now ready to prepare the materials for mixing.

Materials preparation. The dental officer uses a shade guide to determine the number of the shade that matches the patient's tooth. After he gives you the shade number, you can measure out and proportion the correct shade of powder on the glass slab. For a normal-sized mix, use the large end of the measuring stick and measure out four to five portions of the powder (approximately 1/6 teaspoon). Then, using the spatula, divide the powder into halves. Further divide one of the halves into quarters, which makes a half and two quarter portions. Now, divide one of the quarter portions into eighths, so that you end up with a half, a quarter, and two eighth portions of powder. Do not place the liquid on the glass slab until the dental officer indicates that he is ready for you to begin mixing. Place 2 to 3 drops of liquid close to the divided portions of powder and begin mixing the materials.

Mixing technique. To mix the liquid and powder, be sure you use the #142 spatula. To start mixing, incorporate the first portion of the powder (the half portion) into the liquid. Remember always to mix silicate cement with a folding motion, using

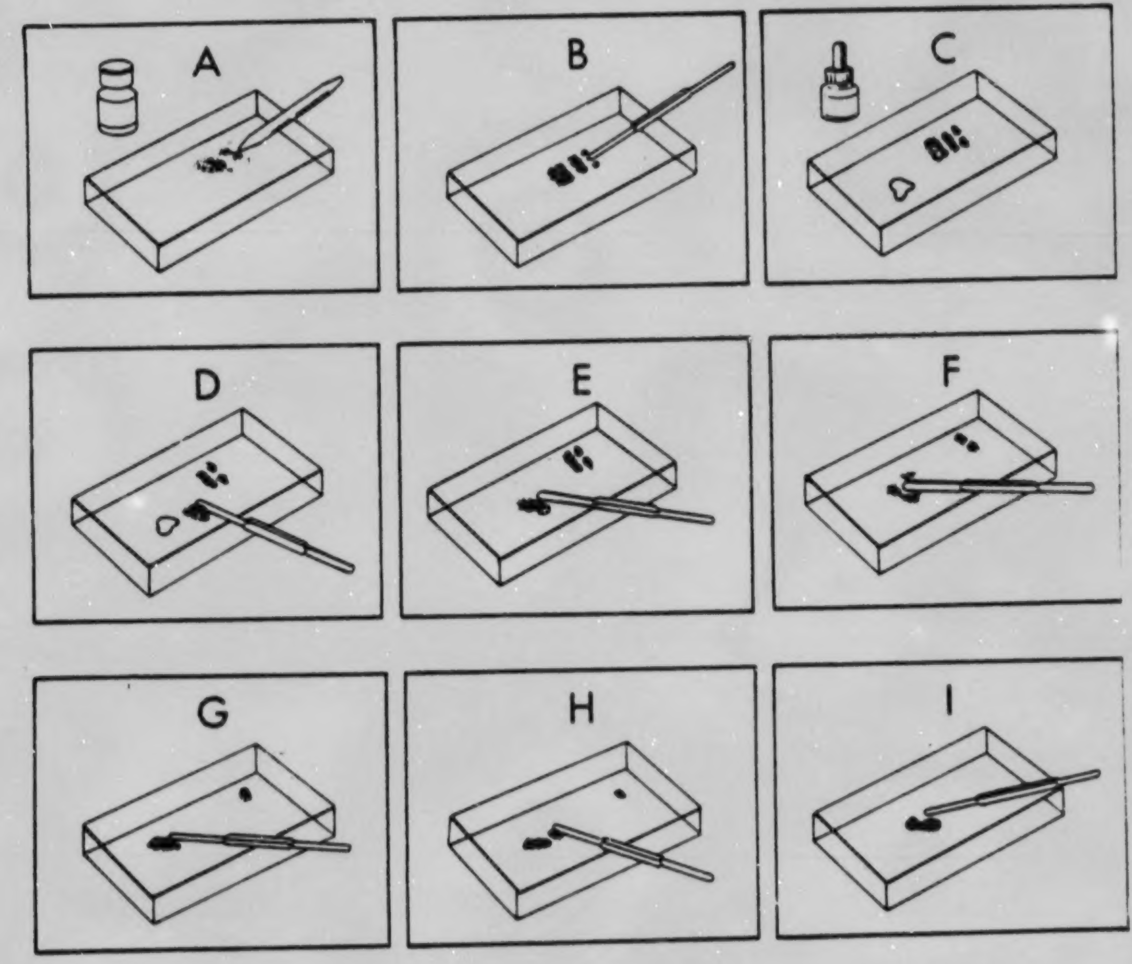


Figure 4-3. Mixing silicate cement.

only a small area of the glass slab. When you have mixed the first powder portion until it appears completely wet, then bring the quarter portion into the mix. Continue adding the portions of powder until the mix is of puttylike consistency. The entire mixing time should not exceed 1 minute. Briefly stated, mix silicate thickly and quickly. (See fig. 4-3.)

When you have completed the mixing of the silicate cement, discard any excess powder. Then leave the mix on the slab and quickly place it within easy reach of the dental officer. The average setting time for most brands of silicate cements is from 4 to 6 minutes. Considering this short setting time, you can see why you must prepare the mix and have it ready quickly in order for the dental officer to have enough time to insert the mix.

Placement procedures. The dental officer uses a clear plastic strip matrix to partially form and hold the silicate cement in place until the initial set is complete. He condenses your mixture into the cavity preparation with one of the stellite plastic filling instruments. After the silicate has set, he trims and smooths the material until it assumes the contour of the natural tooth. Next, the dental officer places a protective coating on it to prevent a gain or loss of moisture. If the newly placed filling is prematurely exposed to oral fluids, it will stain more easily. The premature exposure of a new silicate cement mixture to air can also cause the restoration to stain more easily. To prevent the exposure of silicate cement to air and mouth fluids prematurely, the dental officer coats the cement with silicate lubricant. As with dental amalgam, the key to quality silicate cement fillings is the teamwork between you and the dental officer you assist.

Exercises (422):

1. Which teeth are normally restored with silicate cement?

2. Name the main constituent of silicate cement powder.

3. Why is it important not to introduce any foreign matter into the silicate cement powder?

4. Name the primary ingredients of the silicate cement liquid.

5. What is the effect on the cement's setting time if the silicate cement liquid loses water?

6. List the desirable properties of silicate cement.

7. List the undesirable properties of silicate cement.

8. Name the items needed to mix silicate cement and briefly comment about their proper temperature.

9. How does the dentist determine the number of the shade of silicate cement needed to match the patient's natural teeth?

10. How should you divide the silicate cement powder after you have placed it on the glass slab?

11. Describe the proper mixing motion, final consistency, and mixing time for silicate cement.

12. What is the average setting time for most brands of silicate cement?

13. When the dental officer is placing a silicate restoration, what does he use to partially form and hold the silicate cement in place until the initial set is complete?

14. What instrument does he use to carry and place the silicate cement into the cavity preparation?

15. How is a newly placed silicate restoration protected from premature exposure to oral fluids?

4-3. Composite Filling Materials

Composite restorative materials are now the material of choice for some tooth surfaces and for certain areas of the mouth. Like the other restorative materials, they have both desirable and undesirable properties. The composite restorative materials are available from many different manufacturers. Some examples are Adaptic, Addent, Smile, and Dakor. Each of these materials is somewhat different from the others, and therefore requires special handling. For this reason we will not discuss the mixing procedures for composite filling materials. You should be thoroughly familiar with the manufacturer's instructions concerning the composite restorative material used in your clinic.

423. State the uses and components of composite filling materials and identify their properties.

Uses. Composite restorative materials are used primarily for anterior restorative procedures. They can be used in any of the areas in which silicate cement can be used. Because of their increased crushing strength, they are more suitable for incisal restorations than is silicate.

Components. Basically, all composite restorative material sets consist of a composite material and a catalyst. The exact ingredients of the various composite materials and their catalysts remain closely guarded secrets of their manufacturer. "Composite materials" consist of organic binders and inorganic fillers. The function of the binders, as their name implies, is to bind the mix together during setting. These binders are modified acrylates that become highly crosslinked during setting. The inorganic fillers comprise the bulk (probably 70 percent) of the composite material. Various inorganic materials are associated with the fillers of the different manufacturers. Some of these fillers are fiber glass, natural quartz, glass beads, and other translucent spherical, fibrous, and powdered mineral fillers. These fillers provide a light transmission system for adapting the color of the composite material to the surrounding tooth structure. The composite material is usually supplied in the paste form. Depending on the manufacturer, the composite material comes in jars, tubes, or individual units. The catalyst is the agent that, when mixed with the composite material, causes it to set or harden. These catalysts, depending on their manufacturer, are supplied in either paste or liquid form.

Combined Properties. As stated earlier, composite filling materials have both desirable and undesirable properties.

Desirable properties. The desirable properties of composite filling materials are many. Like silicate cement, they closely resemble the natural tooth structure and, like silicate, these materials are also translucent. The marginal shrinkage of composite fillings is minimal, and this factor reduces the possibility of marginal leakage and recurring caries. Unlike silicate cement, the composite fillings are resistant to water sorption and solubility. Therefore, they are not susceptible to washing out, and they resist staining. Also, the composites are stronger and harder than silicates and resist abrasion. Because of their strength, the composites are better used for incisal restorations than silicate. Probably the most interesting desirable property of this material is its ability to assume the color of the natural tooth. Because of this property, matching the natural tooth's shade or color is not as critical as it is with silicate cement.

Undesirable properties. Primarily the composite filling material has two undesirable properties. We have mentioned the first of these previously. As you recall, silicate cement has an anticariogenic action that is produced when the fluorine from the silicate powder is absorbed by the tooth's enamel. The composite restorative materials do not have this property. Although the composites display little marginal shrinkage and a low incident of recurring caries, they do provide a greater possibility for caries recurrence than does silicate. The second undesirable property is the extremely short shelf life of composite resins. Some composites have such a brief shelf life that the manufacturer's instructions call for the materials to be destroyed 30 days after they have been opened. Unopened, most of the composites can be safely stored for several months, and if refrigerated, their shelf life can be extended further.

Placement Procedures. The placement procedures used with composite filling materials are practically the same as those used with silicate cement. The dentist uses the clear plastic matrix strip to partially form and hold the composite in place until the initial set is complete. He condenses the composite material into the cavity preparation with a stellite plastic restorative plugger. After the material is set, he trims and smooths it until it assumes the contour of the natural tooth. He then places a protective coating over the restoration to protect it from premature exposure to oral fluids.

Exercises (423):

1. What teeth are composite filling materials primarily used to restore?

2. Name the basic components of a composite filling material set.

3. Name the basic ingredients and describe the function of the composite filling materials' organic binders and inorganic fillers.

4. In what form are composite restorative materials usually supplied?

5. What is the function of the composite filling materials' catalyst?

6. Identify the desirable and undesirable properties by indicating which of the following properties apply to composite restorative material. Indicate those that apply by placing an "X" in the spaces provided.

____ *a.* Resembles tooth structure.
____ *b.* Is translucent.
____ *c.* Provides anticariogenic action.
____ *d.* Is water soluble.
____ *e.* Has a long shelf life.
____ *f.* Not susceptible to washing out.
____ *g.* Resists abrasion.
____ *h.* Suitable for incisal restorations.
____ *i.* Highly susceptible to marginal leakage.
____ *j.* Resists staining.
____ *k.* Assumes the natural tooth's color.

7. How do the placement procedures for composite restorative materials compare with those used for silicate cement?

4-4. Zinc Phosphate Cement

In recent years, a large variety of new dental materials has been introduced to the dental profession. Many of these new materials have been widely accepted. Some new materials have generally replaced some of the older materials. Although zinc phosphate cement is among the older dental materials, it is still widely used. One reason for its continued use is its wide range of application.

424. List the uses of zinc phosphate cement, specify its components, and mixing procedures used with zinc phosphate cement, and identify its properties.

Uses. Zinc phosphate cement is used as a cementing agent for crowns, inlays, fixed partial dentures, and other dental appliances. Zinc phosphate cement is also used as a temporary restoration, and as an insulating base under amalgam fillings. It might seem that the components of zinc phosphate cement would be rather complex because of its wide range of application and the complicated sound of its name. Although its chemical makeup is not altogether simple, neither is it overly complex, as you shall see.

Components. Zinc phosphate cement is composed of a powder and liquid, as is silicate cement. Also, like silicate cement, each component is contained in a small bottle. The two bottles arrive in the dental clinic packed in a small box. When you open the zinc phosphate cement box, you find a small corkscrew and a dropper in addition to the two bottles. After you have fitted the rubber part of the dropper into the opening provided in the lid of the bottle, use the corkscrew to remove the stopper from the bottle containing the liquid and close the bottle with the plastic lid. As you examine further, you see that the zinc phosphate cement powder and liquid look much like the components of silicate cement. For this reason, they are sometimes mistaken for each other. Until you can differentiate between the two cement components by sight, it is best to identify them by reading the labels.

Powder. The exact ingredients of zinc phosphate powder vary from manufacturer to manufacturer, but the chief ingredient in all brands of the powder is zinc oxide. In some instances, the powder also contains magnesium oxide, silica, bismuth, trioxide, and certain pigments. The different pigments, of course, produce different shades of powder. Air Force dental clinics use light grey and light yellow shades primarily. If you have any doubt as to which shade you should mix, always ask the dental officer you assist. Now consider the liquid component.

Liquid. The liquid used with zinc phosphate cement powder is composed of phosphoric acid and water. If you remember, these same two ingredients are found in silicate cement liquid. However, the percentages of these constituents are different in the two liquids. Zinc phosphate cement liquid may also contain aluminum hydroxide and zinc hydroxide. When the liquid and powder are mixed, the phosphoric acid combines with the zinc oxide to form zinc phosphate. The manufacturer adjusts the water content to provide a suitable setting time. Too much water in the liquid causes the mix to set rapidly, while too little water causes the mix to set slowly. When the powder and liquid are mixed, they yield certain properties that we call combined properties.

Combined Properties. Zinc phosphate cement in its combined state possesses some desirable and some undesirable properties. In this respect, it is

.219

like silicate cement and amalgam. However, the properties of zinc phosphate cement make it more suitable as a cementing agent than as a filling material.

Desirable properties. The shades of zinc phosphate cement allow it to be used almost inconspicuously, which is definitely a desirable property. This cement is also fairly easily mixed and is easily manipulated after mixing. Another desirable property of zinc phosphate cement is that it can be mixed and used in a fairly thin consistency. This gives the cement sufficient flow to form a very thin layer for cementing crowns, inlays, and fixed partial dentures. Zinc phosphate cement is also desirable because it has low thermal conductivity. For this reason zinc phosphate cement is used under metallic restorations as an insulator, protecting the pulp from the rapid temperature changes that are characteristic of metal restorations. The undesirable properties of zinc phosphate cement are similar to those of silicate cement.

Undesirable properties. Probably the most significant clinical property of zinc phosphate cement is its solubility and disintegration. Cement solubility is the main factor leading to recurrent decay (caries) around crowns and inlays. When it is used as an intermediary base for deep cavity preparations, the acidity of the cement irritates the tooth pulp. The relatively low crushing strength of the cement is also undesirable. The crushing strength of a zinc phosphate cement mix of medium consistency is about 12,000 pounds per square inch or about half that of silicate cement. The strength of the mix is directly proportional to the amount of powder it contains. Therefore, incorporate the maximum amount of powder that still yields the desired mix consistency. Zinc phosphate cement shrinks during setting, which is also undesirable. All of these undesirable properties limit its use to some extent. It is still, however, universally accepted and used as one of the basic dental materials. As with amalgam and silicate cement, the method of mixing zinc phosphate cement is very important.

Mixing Procedure. The mixing of zinc phosphate cement is similar in some respects to the mixing of silicate cement. The differences are significant, however, so be sure you have these differences well established in your mind. If you confuse the exact mixing requirements for silicate cement with those for zinc phosphate cement, you will usually have an unusable mix, and have wasted time and material. The best source of information on the proper mixing procedures is, as we have stated time and again, the manufacturer's instructions. Generally, the steps include equipment preparation, materials preparation, and the approved mixing technique.

Equipment preparation. You need the following items of equipment to mix zinc phosphate cement:

(1) A clean, cool, dry glass slab.

(2) A clean, cool, dry spatula. The spatulas designed for mixing zinc phosphate cement are the #313 and #324 stainless steel types. The above items may need cooling under cold running water before they are used. The temperature of the mixing slab and spatula affects the setting time of the mix.

Materials preparation. When the dental officer indicates that he will use zinc phosphate cement, select a matching set of powder and liquid and measure out the powder. To do this, remove the cap and roll the neck of the powder bottle on the glass slab until you have dispensed from 1/6 to 1/4 teaspoon of powder. The amount of powder depends upon the type of mix desired. (We'll discuss this a little later.) The powder is then divided into portions—generally fourths. Then one of the fourth portions is divided into eighths, and sometimes one of the eighth portions is divided into sixteenths. Such a dividing procedure gives you a total of 6 portions—3 fourth portions, 1 eighth portion, and 2 sixteenth portions. It is best to wait until the dental officer signals that he is ready for you to mix the material before you measure out the liquid. Exposing the liquid to air prematurely can affect the water content and in turn affect the setting time of the cement. With the signal to mix, dispense from 3 to 5 drops of liquid and you're ready to begin the mixing procedure. (The amount of powder dispensed governs the amount of liquid needed.)

There are two types of zinc phosphate cement mixes. The first mix might be described as having a thin to medium consistency. It is used as a cementing agent for inlays, crowns, and other dental appliances. The second type of mix is a thick mix, which is used as a base material under fillings and sometimes as a temporary filling.

Mixing technique. The type of zinc phosphate cement mix depends largely upon the amount of powder incorporated. For a cementing-type mix, incorporate one of the sixteenth portions and spatulate over a large portion of the slab; then follow the same pattern with the next sixteenth portion, the eighth portion, and so on until the desired consistency is reached. A thin to medium mix should be completed in approximately 1½ minutes. The consistency of the mix should appear somewhat creamy and flow from the spatula. To prepare a thick mix, simply add more powder and complete the mix within 1¾ minutes to a maximum of 2 minutes. Be sure the mix is homogeneous (of uniform consistency throughout). (See fig. 4-4.) Always mix zinc phosphate cement over a large area of the slab. This dissipates the heat created by the chemical action of the ingredients. If

220

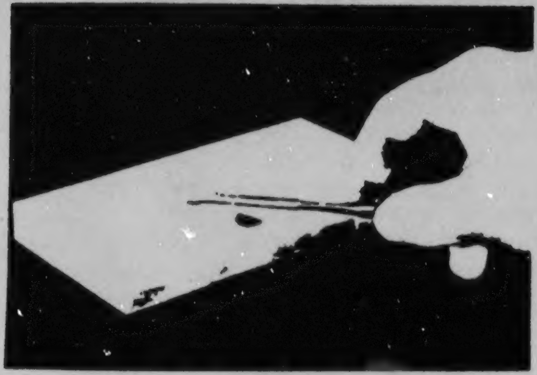


Figure 4-4. Mixing zinc phosphate cement.

the heat is not dissipated it would injure the tooth pulp.

Several factors can influence the setting time of zinc phosphate cement. Factors that shorten the setting time are:

a. A warm mixing slab and spatula.
b. A moist mixing slab.
c. Rapid mixing.
d. Dilution of the liquid with moisture from the air.

Factors that prolong the setting time are:

a. A cool, dry slab.
b. Evaporation of water from the liquid.
c. Mixing over a large area of the slab and slow spatulation.

Exercises (424):

1. List the uses of zinc phosphate cement.

2. What is the chief ingredient of the zinc phosphate cement powder?

3. How do the ingredients of the zinc phosphate cement liquid compare with those of the silicate cement liquid?

4. Identify the following properties that apply to zinc phosphate cement by placing an "X" in the spaces provided.

____ *a.* Insoluble in oral fluids.
____ *b.* Shrinks during setting.
____ *c.* Irritating to tooth pulp.
____ *d.* Easily mixed and manipulated.
____ *e.* Has a high thermal conductivity.
____ *f.* Can be used in thick or thin consistency.

5. What equipment should you use for mixing zinc phosphate cement?

6. What is the mixing time for a thin to medium mix of zinc phosphate cement?

7. What is the mixing time for a thick mix of zinc phosphate cement?

8. Why is it important to mix zinc phosphate cement over a large area of the slab?

9. Indicate the factors that prolong the setting time of zinc phosphate cement by placing an "X" in the appropriate spaces.

____ *a.* Water evaporation from liquid.
____ *b.* Cool slab.
____ *c.* Rapid mixing.
____ *d.* Warm slab.
____ *e.* Slow spatulation.
____ *f.* Dilution of the liquid by moisture.
____ *g.* Mixing over a large area of the slab.

4-5. Insulating Materials

Even though the dental profession has developed many dental materials that have proven to be highly desirable, it has not yet developed the perfect restorative (filling) material. Such a material would provide all the qualities of natural tooth structures. To date, one of the problems with these dental materials has been that many possess very poor insulating qualities.

Those that insulate against some and possibly all irritants are usually deficient in other restorative properties. The result has been the need for separate insulating materials.

425. State the purpose of insulating materials, and describe their uses and mixing procedures.

Insulating materials are used to protect the vital dental pulp from thermal, chemical, electrical, and any other possible sources of irritation. Though researchers have been unable to find the perfect insulating material for the dental pulp, several products are considered valuable. While some provide a nearly adequate strength, they are inadequate as thermal insulators. Others may be adequate as thermal, electrical, and chemical insulators but inadequate in crushing strength. As a result, the dental officer has a variety of insulating

228

221

materials to choose from, and he selects the insulator best suited for each insulating requirement. The most common insulators, in addition to zinc phosphate cement, are variations of calcium hydroxide and zinc oxide mixed with eugenol (oil of cloves).

Calcium Hydroxide. Pure calcium hydroxide is a fine white powder. It is relatively nontoxic and is used by both the medical and dental professions as a protective material. In dentistry, it is widely used as a pulp-capping material because it seems to stimulate the production of secondary dentin, and is also used as a base under permanent restorations. This insulating material is available in powder and paste forms. The powder is sometimes mixed with either sterile water or a local anesthetic to form a paste. The *Federal Supply Catalog* also lists calcium hydroxide in two different paste types.

Hard setting type. This type arrives in two tubes—one tube of base paste, one tube of catalyst (accelerates chemical setting action)—and a mixing pad. To mix them, you simply place small equal portions of base and catalyst on the pad and mix them together. When mixed together, the hard setting type is used as a rigid base under restorations. The brand most often supplied to Air Force dental clinics is "Dycal."

Soft setting type. The soft setting type arrives in a paste form and is used for pulp capping, in pulpotomy procedures, and as a cavity liner under cement bases. This material comes in a tube and there is no mixing involved. The soft setting material most often supplied to Air Force dental clinics is "Pulpdent."

Zinc Oxide and Eugenol. A combination of these two ingredients is used in surgical dressings, in impression materials, in root canal sealing materials, as a base material under restorations, as a cementing agent, and as a temporary or sedative filling material. It is used in surgical dressings because of its soothing effect on tissues and because it possesses mild antiseptic qualities. The major disadvantages of this combination are its low crushing strength and its solubility in mouth fluids.

Zinc oxide and eugenol, which is frequently classified as a dental cement, is also a very good insulating material.

Zinc oxide and eugenol paste. The 6520 *Federal Supply Catalog* lists zinc oxide and eugenol in paste form for use as a pulp protector or, we might say, as an insulating material. The brand most commonly supplied is "Cavitec." Like the hard setting type of calcium hydroxide, zinc oxide and eugenol pulp protective paste arrives in two tubes—one tube of base material and one tube of catalyst. To prepare a zinc oxide and eugenol paste mix, use equal lengths of material from both tubes. You may mix the two on the small parchment pad supplied. This cement will set to a very hard consistency in 3¾ to 4¼ minutes, which makes it usable as a base material under restorations.

Zinc oxide and eugenol cement. You will have many opportunities to mix the zinc oxide powder with eugenol to form a cement. Zinc oxide and eugenol cement is one of the most popular materials for sedative or temporary fillings.

Very little equipment is needed to prepare a mix of zinc oxide and eugenol cement. While you can use a glass slab, it is usually more convenient to use a paper pad with disposable sheets. Use a plastic or stainless steel spatula, or a tongue depressor. When you prepare a mix of zinc oxide and eugenol, the dentist may want to accelerate the setting time. There are a number of materials that you can use for that purpose. However, the one most frequently used is zinc acetate. Because water also acts as an accelerator, this cement sets rapidly when saliva contacts it after insertion. If the prepared cement is stored in a dry atmosphere without an accelerator, it may be kept for a week or longer. There is no definite mixing technique for this cement, but incorporate as much powder as possible into the liquid. You want to form a smooth, homogeneous mass. Of all the cements we have discussed, this is the only one to which you can add more powder or liquid after mixing without adversely affecting the material.

Cavity Liners and Varnishes. Cavity liners and varnishes are the least effective of the actual dental insulating materials. In fact, they are usually not classified as insulators at all. In spite of their inefficiency as thermal insulators, cavity liners and varnishes do serve to partially insulate tooth structures from certain materials. For example, they are used under zinc phosphate cement bases, silicate cement, and composite restorations to insulate the tooth structures from the acids found in such materials. They also serve for a short time as sealers around the margins of restorations. For this reason, cavity liners and varnishes are better known as sealers than as insulators.

Cavity liners are primarily resins in solution in a solvent, whereas cavity varnishes are actually varnishes in solution in a solvent. The solvents used in these solutions are highly volatile and evaporate rather readily. Because of this property, the solutions become thick after a time and a thinner must be added to return them to a usable consistency. The manufacturer supplies the liners and varnishes in sets, each containing a bottle of the sealer and a bottle of thinner. There is no mixing required with this material. The dentist simply moistens a cotton pledget in cavity varnish and applies it to the cavity preparation.

Exercises (425):

1. State the purpose for insulating materials.

2. Why is calcium hydroxide widely used as a pulp capping material?

3. Describe the mixing procedures involved with the hard setting type of calcium hydroxide paste.

4. What should you mix with calcium hydroxide powder to form a paste?

5. How do you mix the paste form of zinc oxide and eugenol?

6. What is frequently used as an accelerator for zinc oxide and eugenol cement?

7. When you are mixing zinc oxide and eugenol cement, how much powder should you incorporate into the liquid?

8. Can you add more liquid to a mixture of zinc oxide and eugenol without adversely affecting the mixture?

9 State the uses of cavity liners and varnishes.

10. What action should you take if the cavity liner or varnish solution gets too thick to use?

4-6. Dental Prosthodontic Materials

All the materials used in the prosthodontic section are incidental to the making of artificial dental appliances, crowns, inlays, and other dental prostheses. We have already discussed the resins used in prosthodontics and cannot include all of them under this heading. We will discuss impression materials in a separate section because they are so numerous. In this section we will consider acrylic resins, gypsum products, dental waxes, and the metals and alloys used in the prosthodontic section.

426. Answer specific questions about the uses and components of the dental resins.

Dental Resins. The use of dental resins has been steadily increasing since the late 1930s. Since then, a considerable amount of refinement and improvement have been made in both the handling and processing of dental resins. True resins are derived from plant secretions, but those used in dentistry are synthetic resins. The synthetic resin, methyl methacrylate, is the most widely used type. It is also referred to as acrylic resin and is available in two different forms—heat-curing and self-curing. Heat must be applied to the heat-curing form before it will harden. The self-curing form hardens at room temperature.

Denture base material. Denture base materials are available in gel form or in a set containing a powder (polymer) and a liquid (monomer). The powder and liquid set is the most widely used in Air Force dental clinics. The heat-cure resins are used to construct the base of full and partial dentures. The *Federal Supply Catalog* lists the following heat-cure denture base materials:

a. Clear.
b. Pink.
c. Fibered, light pink.

The self-cured denture base materials used for making denture repairs are:

a. Pink repair.
b. Fibered, light pink repair.

Resin crown material. Although most anterior crowns fabricated in the dental laboratory are constructed of porcelain, occasionally an acrylic crown is desired. Acrylic resin crowns are fabricated in the dental laboratory, using a heat-curing process. These crowns are made from resins that are shaded to match closely the shade of the patient's natural teeth. Resin crowns are usually made for anterior teeth. Acrylic resin material can also be used for acrylic veneer crowns. The resins used as the veneer (outward layer visible in the patient's mouth) on acrylic veneer crowns are also shaded to match tooth shades. These resins are applied to a metal crown (usually a gold alloy crown) to give the crown a natural appearance. The resins used on these crowns are usually the heat-cure type, but sometimes minor repairs are made with shaded, self-curing resins.

Impression tray resins. During the fabrication of full dentures, the prosthodontist may want to make a final, detailed impression by using a customized impression tray. Such customized trays are made with a special self-curing acrylic resin. This tray resin material is usually light blue or white in color.

Exercises (426):

1. Which form of acrylic resins is most often used for making denture repairs?

2. What terms apply to the powder and the liquid used to make denture base material?

3. How are resin crown materials used in dentistry?

4. How are impression tray resins used in dentistry?

427. Characterize the gypsum products and their uses.

Gypsum Products. The gypsum products are supplied as powders. When it is mixed with water in the right proportions, the powder forms a paste that gradually hardens to a solid. This setting, or hardening, process takes place over a period of several minutes, during which time the mixture is soft and pliable and can be formed into the desired shape. The setting process accelerates as it progresses. As it finally solidifies, the plaster gives off an appreciable amount of heat, which is characteristic of all gypsum products. Each of the materials in the gypsum group is carefully compounded to give it the particular combination of physical properties needed to do a particular job. The gypsum products you will use most are plaster of paris and hydrocal (artificial stone).

Plaster of paris. Under a microscope, gypsum appears to be made up of tiny crystals, and each crystal contains a definite amount of water. It is converted into plaster by grinding it into small particles and heating it slowly to remove the water. The amount of water that is removed by heating determines the behavior of the plaster when it is again mixed with water. Plasters made for dental use are specially processed to provide high purity and suitable working properties. These properties must be uniform within each batch and from one batch of material to another. One of the most important requirements is that it must set within a definite time limit. The amount of its setting expansion must also be within reasonable limits.

Plaster has many uses. Among them are the following: (1) to form casts, (2) to construct matrices, (3) to attach casts to the articulator, (4) to combine as an ingredient in certain high-heat investments, and (5) to make certain impressions. The initial setting time for most dental plasters is from 5 to 12 minutes. The final setting is complete in approximately 45 minutes.

Hydrocal. Chemically, hydrocal (dental stone) is very similar to plaster of paris, but the method of manufacturing dental stone is somewhat different and the two differ in their physical properties. If you compare hydrocal and plaster particles under a microscope, you will see that the plaster particle is long, needlelike, and quite porous. The hydrocal particle is smaller, much more dense, and relatively nonporous. For this reason, hydrocal requires less water in mixing, and sets more slowly. When it is set, it is harder, denser, and has a higher crushing strength. These properties make hydrocal preferable to plaster as a master cast in complete and partial denture construction, since it can withstand more pressure in flasking and packing and is less apt to be scratched or damaged in the laboratory. Hydrocal has many dental uses. The more common ones are pouring casts and dies, and flasking dentures for processing. Hydrocal is colored yellow by the manufacturer to make it easily distinguishable from plaster. The initial set of a typical hydrocal mix is from 7 to 15 minutes. The final set is completed in approximately 45 minutes.

Exercises (427):

1. As final solidification takes place, what is "given off" by all gypsum products?

2. List the dental uses of plaster of paris.

3. What are the initial and final setting times for plaster of paris?

4. Is more water needed for mixing hydrocal or for mixing plaster of paris?

5. What are the most frequent dental uses of hydrocal?

6. Give the initial and final setting times for hydrocal.

428. Given a list of dental waxes, identify their uses and characteristics.

Dental Waxes. Dental waxes are used at some stage in the construction of all dentures, inlays, crowns, and other maxillofacial appliances. The waxes are supplied in many different forms, each with specific properties necessary for an intended purpose. It is important to use the proper wax.

Baseplate wax. Baseplate wax is supplied in two types—hard (type I) and medium (type II). The hard type is better for warm temperatures because it resists flow at higher temperature, but it may be too brittle and have a tendency to crack at lower temperatures. The medium type is satisfactory for colder temperatures, but it may exhibit too much flow in a warmer environment. Baseplate wax is used for occlusal rims, as a boxing matrix, and for many miscellaneous purposes. This wax is pink and is available in both sheet form and in the 1½-inch wide ribbon form, which is rolled in a dispenser carton.

Bite wax. Bite wax is a metal-impregnated wax used by the dentist to transfer the occlusal relationship of the teeth from the patient to the casts. This permits the dental laboratory specialist or technician to set the teeth in the proper position.

Boxing wax. Boxing wax is a red, specially-prepared wax, which is supplied in strips about 1½ inches wide and 12 inches long. Its principal use is to box impressions. (Boxing is the act of enclosing the impression with a matrix when pouring a cast.) It is also used in making a plaster matrix when a complete denture is duplicated.

Indicator wax. Indicator wax is coated with a water soluble adhesive on one side. It is usually green and is used for registering occlusal contact on natural teeth, individual restorations, fixed partial dentures, removable partial dentures, and complete dentures. It is sometimes used by the dentist to determine premature contact (high spots) on restorations.

Inlay wax. Inlay wax is one of the most carefully compounded of all the dental waxes, and is used to make wax patterns for crowns, inlays, and pontics. Inlay wax is supplied in sticks, in both hard (dark blue) and medium (blue) grades (the dark colors contrast with the color of the teeth) and also in ivory or white with no color pigment. This last type is used for waxing the pattern for acrylic jackets because it does not leave a colored residue in the plaster mold, which might discolor the resin of the jacket crown.

Sticky wax. Sticky wax is made of beeswax, paraffin, and resin. It is dark blue, dark red, or dark violet in color. The resin gives the wax its adhesiveness and hardness. An important requirement of sticky wax is that it must break under pressure rather than bend or distort. This property makes it useful for holding the parts of a broken denture together so that it can be repaired.

Utility wax. Utility wax is a red wax that is supplied in round rope form. It is extremely pliable and somewhat tacky at room temperature, which makes it usable without heating. The most important use of utility wax is in beading (outer trimming) impressions before boxing and pouring the model. It has various other uses, one of which is to provide a rimlock for impression trays.

Disclosing wax. Disclosing wax is an ivory colored wax that comes in a paste form. It is extremely low fusing, melting at mouth temperature. Disclosing wax is used to determine the fit of full and partial dentures.

Exercises (428):

Identify the uses and characteristics of the waxes in column A by matching them with the statements in column B.

Column A

____ 1. Boxing wax.
____ 2. Utility wax.
____ 3. Inlay wax.
____ 4. Baseplate wax.
____ 5. Sticky wax.
____ 6. Indicator wax.
____ 7. Disclosing wax.
____ 8. Bite wax.

Column B

a. A metal-impregnated wax used to transfer the occlusal relationship of the teeth from the patient to the casts.
b. A wax supplied in a strip about 1½ inches wide. It is used to enclose the impression with a matrix when pouring a cast.
c. Composed of beeswax, paraffin, and resin, this wax will break rather than bend under pressure. It is used to hold the parts of a broken denture together so that it can be repaired.
d. The most carefully compounded of all the waxes, it is used to make wax patterns for crowns, inlays, and pontics.
e. Used to bead impressions and provide a rimlock for impression trays, this wax is pliable and somewhat tacky at room temperatures.
f. Ivory-colored low fusing wax that comes in a paste form. It is used to determine the fit of dentures.
g. Available in hard and medium types for use in different climates, this wax is used for occlusal rims.
h. Coated with a water soluble adhesive on one side, this wax is used for registering occlusal contact on teeth, restorations, and dentures.

429. Identify the properties or characteristics of metals.

Dental Metals and Alloys. There is no satisfactory, all-inclusive definition for metals. However, they do have certain characteristics that distinguish them from nonmetals. They possess a metallic luster, are good conductors of heat and electricity, and are usually solids at ordinary temperatures. Each metal possesses physical properties peculiar to it alone, which distinguish it from all other metals. It has a melting range, a specific gravity, a certain degree of hardness, malleability, and ductility. By knowing these physical properties, you can predict with a fair degree of accuracy the way in which the metal will behave under different conditions.

Metal properties. The different types of alloys used in dentistry are scientifically prepared by the refiners to give them the exact properties needed for special dental purposes. This careful balancing of the properties of the alloy is of value only when the alloy is properly handled. The physical properties that make metals and alloys useful in dentistry are listed below:

- Hardness. This is the ability of an alloy to resist indentation or scratching.
- Ductility. This is the property of a metal that permits it to be drawn or stretched without breaking.
- Malleability. Its malleability indicates the amount of bending and shaping a metal can sustain without breaking.
- Specific gravity. This is the weight of a volume unit of metal compared with an equal volume of water at the same temperature.
- Melting range. This is the range of temperatures that can melt a particular alloy.
- Melting point. This is the point at which a pure metal melts.

Exercises (429):

In items 1 thru 6, identify the properties of metals by matching the statement in column B to the related property in column A.

Column A

___ 1. Malleability.
___ 2. Melting range.
___ 3. Hardness.
___ 4. Specific gravity.
___ 5. Melting point.
___ 6. Ductility.

Column B

a. The weight of a volume unit of metal compared with an equal volume of water at the same temperature.
b. The exact temperature at which a pure metal will melt.
c. The indication of the amount of bending and shaping a metal can sustain without breaking.
d. The ability of an alloy to resist indentation or scratching.
e. The property of a metal which permits it to be drawn or stretched without breaking.
f. The areas of temperature in which a particular alloy will melt.

430. Given a list of dental metals, identify the use of each.

Dental gold. Gold possesses a combination of physical properties that is unique among metals. Although too soft to be used alone for most dental purposes, it can be combined with other metals in varying proportions to produce alloys of almost any combination and degree of the desired properties. It is entirely unaffected by mouth fluids. It is extremely malleable and ductile, and can be burnished tightly to the surface of a tooth to produce a margin that is sealed against saliva and other fluids. It can be made hard enough to withstand heavy occlusal wear, or soft enough to wear at about the same rate as the opposing teeth. Properly alloyed with other metals, it can be used to fabricate every type of dental restoration or prosthesis where metal is indicated. The gold alloys used in US Air Force dentistry are of three main types: casting gold, wrought gold, and gold solders. Pure gold is used in the form of foil, powdered gold, mat foil, and powdered gold wrapped in gold foil.

a. Casting gold. The casting golds are alloyed and made into ingots which are suitable for melting and casting into molds during the fabrication of individual tooth restorations and cast appliances. Different types of restorations require alloys with slightly different physical properties. The alloy used for an inlay must have somewhat different characteristics from one that is to be used for a partial denture. Similarly, a one-surface inlay does not need the hardness of a large inlay that is to be the abutment for a bridge. The gold used for the clasp on a partial denture needs a still different combination of properties. For these reasons, the casting golds are further classified into four types:

(1) Type A or 1 (soft). This type of gold alloy is used for inlays that will not be subjected to much stress. It is relatively soft and malleable and is easily burnished.

(2) Type B or 2 (medium). This type of gold is used for inlays that will be subjected to more stress. Three-quarter gold crowns can also be cast from this type of gold.

(3) Type C or 3 (hard). This type is used for crowns and fixed partial denture abutments.

(4) Type D or 4 (extra hard). This type of gold alloy is used in prosthetic appliances for saddles, clasps, bars, and one-piece, removable partial dentures.

b. Wrought gold. Wrought gold alloys are in the form of wires and bars that can be used to make prosthetic or orthodontic appliances. The gold is alloyed to give it the properties needed so that it can be bent and shaped into a desired form and so that several different units can be joined by dental solder. The manufacturer makes wrought gold from gold alloy, which has been rolled, swaged, and drawn through die plates into the desired shape and gage. It must have a high melting range so that each part of the appliance can be soldered without overheating or melting the wire.

c. Gold solders. Dental gold solders (brazing alloys) are alloyed so that they can be melted and flowed onto the parts to be joined without overheating them. The ideal solder is similar in color and physical properties to the metal being joined. The solder must melt and flow at a temperature at least 100° F. below the lower limit of the melting range of the parts being joined.

d. Gold foil. Gold foil is unusual among restorative materials because it is one of the few metals used in a pure state. Gold foil is supplied in two forms, cohesive and noncohesive. Unless cohesive foil is protected from air, its cohesiveness will diminish. Noncohesive foil is different. Certain impurities from moisture or gas residues condense on its surface. These prevent the gold particles from coming into actual contact with, and adhering to each other. Usually, these impurities can be removed by converting them into a vapor. The common practice is to heat the foil to a red color before condensation, which also softens the foil. This process is called annealing. The foil is then mechanically condensed into a prepared cavity. The cohesiveness of the gold foil with the mechanical condensation produces a well-bonded restoration.

Chrome-cobalt alloys. Chrome-cobalt alloys are considerably harder than gold alloys and have a much higher melting range. Special equipment and training are needed to manipulate these metals. Chrome-cobalt castings are stronger, lighter, and less expensive than gold. They are used for all types of cast removable partial dentures but are not suitable for crowns, inlays, or fixed dentures.

Exercises (430):

Identify the use of the various dental metals by matching the use in column B to the appropriate metal in column A.

Column A	*Column B*
____ 1. Gold foil.	*a.* Used for inlays which are not subjected to much stress.
____ 2. Chrome-cobalt alloys.	*b.* Used for cast removable partial dentures, but not suitable for crowns, inlays, or fixed partial dentures.
____ 3. Type C casting gold.	*c.* Used in its pure state for restorations.
____ 4. Type A casting gold.	*d.* Used to join metal parts together.
____ 5. Wrought gold.	*e.* Used for crowns and fixed partial denture abutments.
____ 6. Gold solders.	*f.* Used to make prosthetic or orthodontic appliances. It is supplied in wire or bar forms which are bent into shape.

4-7. Impression Materials

Much of the work done in making prosthodontic, orthodontic, oral surgery splints, and other dental appliances, crowns, and inlays is done outside the mouth on stone casts. Casts facilitate access to the work area and prevent injuries to oral soft tissues from hot waxes and other harmful material. Such procedures as casting and soldering cannot be done in the patient's mouth.

431. State the use of dental impression materials, and identify their characteristics.

To make a stone cast, there must first be a negative reproduction of a patient's mouth. A negative reproduction is obtained with impression material. It is then poured up with a gypsum product, producing a positive reproduction called a cast. Though there are many types of impression materials usable for this purpose, no one material fulfills all the requirements for making a perfect negative reproduction of the oral structures. Therefore, because clinical situations and dentists' techniques vary, so will the choice of the material to be used. There are several ways in which the impression material may be classified—according to its rigidity, plasticity, chemical reaction, elasticity, and use.

Plastic Compounds. Plastic impression compounds soften when heated and harden when cooled, with no chemical action taking place. The exact composition of a plastic impression compound varies with the type and the manufacturer. These plastic compounds come in several colors (red, green, black), and in stick or cake (wafer) form. These materials are used to make personalized impression trays and impressions. The plastic compounds must be heated in a water bath before they are placed in impression trays. They are divided into two types. Type I compound is a low-temperature fusing material. It is used with copper bands for inlay and crown impressions, and for recording "functional" or "preliminary" impressions. Type I compound softens between 126° F. and 144° F., and is compatible with the oral tissues. Type II compound is a high-temperature fusing material, relatively tough, and strong enough to act as a tray to support other types of impression materials. Materials of this type soften at a temperature above 158° F., and are not compatible with oral tissue because of this higher temperature. Be careful when you soften this material because overheating makes it so sticky that it is extremely difficult to handle. When it cools, plastic impression compound becomes hard and brittle. Trimming an impression correctly requires a sharp knife to reduce the possibility of breakage.

Wax Compounds. Impression wax is a low-temperature fusing material that can be used as a "wash" to correct defects or deficiencies in other impressions. It is especially compounded so that it flows at mouth temperature. After this wax is melted in a water bath, it is painted in the individual impression tray to serve as a corrective liner for final impressions. If you rinse the impression, do so very carefully with cool water. Also avoid touching the wax areas with your fingers because they may cause the wax to flow and distort the impression surface.

Impression Paste Compounds. Impression paste is also used as a corrective "wash." This paste contains zinc oxide and eugenol and is supplied in two tubes. One tube contains the base material; the other the hardener. Equal lengths of material from each tube are used. Because cleaning up after preparing this material is difficult, you will save time by mixing it on a parchment pad, using a tongue depressor for a spatula. You can discard both the parchment sheet and the tongue depressor when you have finished. If you want to increase the setting time of this material, decrease the amount of hardener. To decrease the setting time, increase the amount of hardener. As with all the materials we have discussed previously, you should read and follow the manufacturer's instructions.

Rubber-Base Compounds. The rubber-base compounds are soft, synthetic, rubberlike materials, supplied in two collapsible tubes. One tube contains a base, and the other a hardener. When the two are mixed together in the proper proportions, the resulting mixture sets in a semihard, rubbery state. These materials have a short shelf life because of their unstable polysulfide base.

Rubber-base impression materials can be used for almost any type of impression. They come in three consistencies:

(1) Light bodied, to be used ejected with a syringe onto preparations for inlays, crowns, and fixed partial dentures.

(2) Regular bodied, to be used in an impression tray for inlays, crowns, and fixed partial dentures, and as "wash" impressions for full dentures, relinings, and removable partial dentures. Its high degree of flow registers the finest details.

(3) Heavy bodied, to be used in a tray to force light bodied impression material onto the cavity preparation, or with a copper band for impressions of single teeth.

Rubber-base impression materials should be mixed in 45 to 60 seconds. Using a stirring motion, mix the base and hardener until the mix is free of color streaks and is uniform in shade. After the mix is prepared, load the syringe or the impression tray.

Hydrocolloid Compounds. Hydrocolloid impression materials are primarily used for partial denture impressions because of their elasticity. As a consequence of this elasticity, they have the ability to spring over undercuts without breaking or distorting. There are two types of hydrocolloids—agar (reversible) and alginate (irreversible). They differ chemically and physically and require different handling, but the purposes for which they are used are very similar.

Agar hydrocolloid is a thermoplastic material that solidifies upon cooling. Since this procedure can be repeated again and again with the same agar, it is said to be reversible. You need water-cooled trays when you use this material. Pour the impressions immediately to prevent shrinkage and distortion due to dehydration.

Alginate hydrocolloid is supplied in the form of a fine powder. With a prescribed amount of distilled water at a controlled temperature, you mix the powder to a thick, creamy consistency.

Impression Plaster Compound. Impression plaster has been specially compounded by the manufacturer for use in the oral cavity. The behavior of plaster that is to be used for an impression must be different in several respects from ordinary dental plaster. A prime requirement is that it must set much faster, to reduce the time it must be held in place in the patient's mouth. Various accelerators and retarders are added to give the plaster these required properties.

Exercises (431):

1. State the use of dental impression materials.

Identify the characteristics of dental impression materials by matching each statement in column B to the correct material in column A.

Column A	*Column B*
____ 2. Rubber-base compounds.	*a.* Flows at mouth temperature and is used as a corrective liner for final impressions.
____ 3. Wax compounds.	*b.* Available in the agar and alginate types, this material is highly elastic.
____ 4. Impression plaster compounds.	*c.* A material that is heated in a water bath before it is placed in the impression tray. Some types, when softened, are too hot for oral tissues.
____ 5. Impression paste compounds.	*d.* Used as a corrective, this material consists of zinc oxide and eugenol and is supplied in two tubes.
____ 6. Hydrocolloid compounds.	
____ 7. Plastic compounds.	

Column B

e. This material is available in three consistencies. It sets in a semihard rubbery state. It can be used for almost any type of impression.

f. A gypsum product that is specially compounded for use in the mouth. It sets much faster than other gypsum products.

4-8. Endodontic Materials

The main materials used in root canal therapy are various liquid antiseptics, paper points, gutta-percha points, and silver points. The dental officer uses these to treat and fill a properly prepared root canal from which he has removed the pulp.

432. Characterize the uses and properties of endodontic materials.

Paper Points. Paper points are used during the treatment phase of endodontics. They are usually saturated with an antiseptic (ethyl alcohol, camphorated parachlorophenol, and sometimes creosote) and inserted into the prepared canal to act as antiseptics (bacterial growth inhibitor) and bactericidals (bacterial destructions agents). Paper points are never used as a permanent root canal filling material.

Root Canal Restorative Materials. Root canal restorative materials are used to fill the previously prepared root canals, as part of root canal or endodontic therapy. Root canal restorative materials consist of tapered gutta-percha or silver points in a variety of standard sizes, and root canal sealers or cements. A good root canal restorative material is insoluble in tissue fluids, opaque to the passage of X-rays, reasonably easy to remove, nonirritating to periapical tissues, nonabsorbent, and dimensionally stable after its insertion into a root canal.

Gutta-percha. Gutta-percha is used for temporary restorations as well as for a root canal restorative material. Gutta-percha is the refined, coagulated, milky exudate of certain trees in the Malay Peninsula in Southeast Asia. It is pink or gray in color, softens when heated, and easily molded. When it is cool, it maintains its shape fairly well. Gutta-percha points have been a choice for root canal restorative material for many years. The material has many advantages: it has a high thermal expansion, does not shrink unless used with a solvent, is radiopaque, can be kept sterile in an antiseptic solution, is resistant to moisture, is bacteriostatic, and is a poor conductor of heat. On the disadvantage side, gutta-percha shrinks when it is used with a solvent and is not always easily inserted into the root canal. You prepare gutta-percha points for insertion by disinfecting them in tincture of metaphen or by washing them in alcohol. They are then air-dried and cemented into the root canal with root canal cement.

Silver points. The dental officer may also use silver points to fill the root canal. They share the many advantages mentioned for gutta-percha. Silver points, however, are easier to insert and come in the same sizes and tapers as standard root canal files and reamers. The main disadvantage in the use of silver points is that they are hard to remove from the root canal. The dental officer first selects the silver point, fits it to the canal, and prepares it for insertion by sterilizing it in an open flame or in a bead sterilizer. He passes the point through a thin mix of a special silver point cement. He then inserts it into the root canal, which he has previously coated with the cementing medium.

Root Canal Sealers. The root canal sealers or cements most commonly used in American dentistry are in cement and paste forms. The zinc oxide and eugenol type is the one most often used. The liquid is, of course, the eugenol. A typical zinc oxide powder formula may contain the following ingredients:

a. Zinc oxide—main ingredient.
b. Resins—oleo or Staybelite types.
c. Thymol iodide—a bactericide.
d. Bismuth subcarbonate—an antacid.

In addition to the above ingredients, some formulas contain silver particles or barium sulfate, which add radiopaque (ability to stop radiant energy, such as X-rays) qualities. These ingredients are mixed in much the same way as is zinc phosphate cement. Using a glass slab and a noncorroding spatula, incorporate the powder into the liquid until a thick, creamy consistency is reached. The pastes sometimes used as sealers are chloropercha and eucapercha, made by dissolving gutta-percha in chloroform or eucalyptol. The cements are used to cement both silver and gutta-percha points in place, but the pastes are usually used with gutta-percha points only.

Exercises (432):

1. How are paper points used during endodontic treatment?

2. What characteristics should a good root canal filling material possess?

3. How is gutta-percha used as an endodontic material?

4. What are the disadvantages when gutta-percha is used as an endodontic material?

5. State the main disadvantage of using silver points as the root canal restorative material.

6. Name the type of root canal cement most often used.

7. Describe the manufacture of the root canal pastes that are used as sealers.

4-9. Surgical Dressings

During the course of oral and periodontal surgery, the dental officer exposes oral soft tissues and sometimes bone, leaving raw wounds. Surgical dressing materials are usually applied to the wounds as a protective barrier. They are sometimes referred to as "surgical packs."

433. Cite the uses of surgical packs and identify the purpose of each of their ingredients.

Surgical packs are placed on soft tissue or bony wounds as both a protective barrier and a soothing and healing agent. They are primarily used to treat "dry socket" and to act as a gingival bandage after periodontal surgery. These packs not only protect the area by preventing food from touching the excised margins but also soothe and aid in healing the tissues. Your main duty will be to mix the ingredients and form the packs that the dental officer places in the patient's mouth.

Types. There are essentially two types of surgical dressings—those that contain eugenol and those that do not. The dressings containing eugenol are more widely used. Any of five commercial brands of surgical dressings may be used in your dental clinic. Dressings with eugenol are made by Kirklands, Wards, Schleins, and Professional Products Company. The noneugenol type is the Coe-Pack. This type is usually used on patients whose surgery left some exposed bone or who are allergic to eugenol.

Local Formulation. Many dental officers prefer to use a powdered mixture from the hospital pharmacy with which you must mix the desired liquid. One preferred dressing is Glickman's formula. The formula for this powder mixture, blended at the pharmacy, contains the following ingredients in the amounts shown:

Zinc oxide	63 grams
Rosin	30 grams
Asbestos fibers	5 grams
Zinc acetate	2 grams

To use all of this powdered mixture, the liquids necessary for the proper consistency are:

Eugenol	80cc
Olive oil	20cc

The eugenol and zinc oxide are both agents that soothe pain. The powdered rosin and asbestos fibers give strength to the dressing so that it can remain in the mouth for the required time—usually 5 to 7 days. The dental officer may vary the above formula. He may want to add thymol or other aromatic oils to give a more desirable flavor to the dressing, and coloring agents to make the dressing less noticeable in the patient's mouth. Tannic acid can be added to check bleeding. He may use foil between the tissues and the dressing so that no sutures become embedded in the periodontal dressing as it hardens.

Exercises (433):

1. Why are surgical packs used?

2. On what patients would the noneugenol type of surgical pack be used?

Identify the purpose of each ingredient in the surgical pack by matching its action in column B to the ingredient in column A.

	Column A	*Column B*
____	3. Tannic acid.	*a.* Esthetics.
____	4. Thymol.	*b.* Strength.
____	5. Rosin and asbestos fibers.	*c.* Flavor.
____	6. Zinc oxide and eugenol.	*d.* Check bleeding.
____	7. Coloring agents.	*e.* Soothing effect

4-10. Miscellaneous Dental Materials

In addition to the materials we have already discussed, there are other materials that have an important place in dentistry. For lack of a better classification, we call these miscellaneous dental materials.

434. Given a list of miscellaneous dental materials, select the correct use of each.

Temporary Stopping. Temporary stopping is a temporary restorative material. It is usually composed of gutta-percha, waxes, zinc oxide, and fatty acids, and possibly powdered feldspar or silex. This material dissolves in the mouth fluids to some extent. It is easier to handle and manufacture than gutta-percha, but does not wear as well. It can be made plastic by heat or can be dissolved in chloroform or eucalyptol.

Dental Porcelain. Dental porcelain is manufactured in the form of a powder. When it is heated to a very high temperature in a special oven (called baking), it fuses into a homogeneous mass. When it cools, the mass is hard and dense. Dental porcelain is manufactured in a variety of shades to match most tooth colors. The translucency of baked porcelain is like that of dental enamel, so that porcelain crowns, pontics, and inlays of a highly pleasing appearance can be made.

Baseplate Materials. Baseplate materials are used in constructing full and partial dentures, bite-rim foundations, and impression trays. Baseplates are usually softened over an open flame and then molded over a cast and trimmed. Most baseplates are composed of resins and shellac, with various powders used as fillers.

Impression Adhesive. Impression adhesive is a special gluing agent for bonding rubber base impression materials (polysulfide) to impression trays. It can bond the polysulfide to metal, acrylic, or compound impression trays. Impression trays are coated with this adhesive before they are filled with rubber base impression material, insuring that the impression material stays in the tray when it is removed from the mouth.

Dental Abrasives. Unless the surface of the restorations and appliances are smooth and highly polished, they cannot be kept clean. Food, debris, and salivary deposits collect on a rough surface, producing calculus. If all the surfaces of the restorative materials and the natural teeth are smooth and polished, the cleansing action of the tongue, assisted by proper toothbrushing or denture cleansing, should prevent the formation of any permanent deposits. In dentistry, a group of materials, called dental abrasives, are used for smoothing and polishing the restorations and appliances that are placed in the mouth.

Pumice. The first of these materials is pumice, a finely ground, sandlike material used as an abrasive and polishing agent for acrylic resins, amalgams, and gold. It is mainly composed of complex silicates of aluminum, potassium, and sodium. The *Federal Supply Catalog* lists two grades—flour of pumice and coarse pumice. Flour of pumice is used for putting the final shine on appliances and for polishing restorations. Coarse pumice is primarily used in the dental laboratory as an initial rough polish for dentures. Pumice should never be used in the patient's mouth.

Zirconium silicate. A material that has replaced pumice for polishing teeth is zirconium silicate. Zirconium silicate is mixed with water or a stannous fluoride solution for caries prevention treatment.

Tin oxide. Another material used to polish teeth and restorations is tin oxide. It is a fine, white powder, which is made into paste form by mixing it with water or glycerin.

Chalk. Chalk (whiting) is used as a polishing agent for both acrylic resins and metals. Its main component is calcium carbonate.

Rouge. This is a polishing agent, not used in the mouth, that imparts a high luster to gold. It is composed of iron oxide and is usually supplied in cake or stick form.

Tripoli. This polishing agent is used in the dental laboratory for gold and other metals. It is made from certain porous rocks found near Tripoli in North Africa and is supplied in cake form. Tripoli is slightly more abrasive than rouge and is usually used just before the rouge is used.

Abrasive paste. The final material in this group is dental abrasive paste. This is made of very finely ground silicon carbide particles incorporated in a greaseless base. Its primary use is to "mill-in" complete dentures, but it can be used to increase the abrasive action of the carborundum stones used in cavity preparation.

Exercises (434):

Identify the use of each of the miscellaneous dental materials by matching the use in column B to the material in column A.

Column A

____ 1. Baseplate materials.
____ 2. Coarse pumice.
____ 3. Rouge.
____ 4. Temporary stopping.
____ 5. Impression adhesive.
____ 6. Tripoli.
____ 7. Zirconium silicate.
____ 8. Abrasive paste.
____ 9. Dental porcelain.

Column B

a. To impart a high luster to gold.
b. For polishing teeth.
c. As a temporary restorative material.
d. To make crowns and pontics.
e. For making bite-rim foundation.
f. A polishing agent usually used just prior to rouge.
g. To "mill-in" complete dentures.
h. As an initial rough polish for dentures.
i. To hold rubber base impression material in the tray.

Answers for Exercises

CHAPTER 1

Reference:

400 - 1. Handle, shank, and working end.
400 - 2. Nib.
400 - 3. The purpose of the instrument; the position or manner of use; the shape of the working end; and the angle of the working end in relation to the handle.
400 - 4. Normally on the portion of the handle farthest from the working end of single-ended instruments and near the center of double-ended instruments.
400 - 5. The formula number.

401 - 1.
- *a.* Vitalometer.
- *b.* Dressing forceps.
- *c.* Transilluminator.
- *d.* Clinical thermometer.
- *e.* Dental radiograph.
- *f.* Mouth mirror.
- *g.* Explorer.

401 - 2. g.
401 - 3. c.
401 - 4. b.
401 - 5. f.
401 - 6. a.

402 - 1.
- *a.* A, C, D, F, G.
- *b.* H, I, and J.
- *c.* B and E.

402 - 2. D and F.
402 - 3. A and H.
402 - 4. E.
402 - 5. I.
402 - 6. B, C, E, G, and J.
402 - 7. G.
402 - 8. C.
402 - 9.
- *a.* 901.
- *b.* $33^{1}/_{2}$, 35, 37, and 39.
- *c.* 699, 700, 701, 702, and 703.
- *d.* 1/4, 1/2, 2, 4, 6, and 8.
- *e.* 557, 558, and 559.
- *f.* 169L and 170L.
- *g.* 57.

403 - 1. The shaft upon which an abrasive disk or wheel is mounted.
403 - 2. Safe-sided disk.
403 - 3. To cut tooth structures and to smooth and polish restorations.
403 - 4. To smooth and reduce high spots on restorations or prosthetic devices.
403 - 5. Disks are thinner and usually have abrasives on only one side. Wheels usually have abrasives on both sides and on the outer edges as well.
403 - 6. Conventional speed angle or straight handpieces.
403 - 7. They are usually used with abrasives to remove stains and to polish teeth, restorations, and dental appliances.
403 - 8. They are screwed into the handpiece.
403 - 9. For polishing dentures or other prosthodontic appliances.
403 - 10. Sterilization can affect the abrasive bond.

404 - 1. T.
404 - 2. T.
404 - 3. F.
404 - 4. T.
404 - 5. T.
404 - 6. F.
404 - 7. F.
404 - 8. F.
404 - 9. T.
404 - 10. T.
404 - 11. T.

CHAPTER 2

405 - 1. i.
405 - 2. g.
405 - 3. e.
405 - 4. a.
405 - 5. b.
405 - 6. c.
405 - 7. h.
405 - 8. f.
405 - 9. j.
405 - 10. d.
405 - 11. a, b, e, g.
405 - 12. f, h.
405 - 13. d, e, i, j.

406 - 1. T.
406 - 2. F.
406 - 3. F.
406 - 4. F.
406 - 5. F.
406 - 6. T.
406 - 7. F.

407 - 1. A, C.
407 - 2. B, I.
407 - 3. F.
407 - 4. E, H.
407 - 5. D.
407 - 6. G, J.
407 - 7. E.
407 - 8. G.
407 - 9. F.
407 - 10. A.

407 - 11. J.
407 - 12. H.
407 - 13. D.
407 - 14. B.
407 - 15. I.
407 - 16. C.

408 - 1. The #142. Other spatulas can discolor the mix.
408 - 2. It is a smaller version for mixing small quantities of cement.
408 - 3. It should be thoroughly cleaned and disinfected.
408 - 4. To transport and place dental cements, resin, and temporary, insulating, and pulp-capping materials.
408 - 5. The #1 — 2 and #5 — 7.

409 - 1. To fit almost any conceivable cavity preparation.
409 - 2. The #23 explorer. It has a tiny, flat, serrated tip.
409 - 3. Over the Bunsen burner tube.
409 - 4. Annealing burns off the gasses and allows the gold foil to adhere to itself and contributes to a well-bonded restoration.

CHAPTER 3

410 - 1. The beaks, the neck, and the handles.
410 - 2. They have a concave inner surface and a convex outer surface, and are shaped to conform snugly to the contour of the tooth.
410 - 3. Two sets of parentheses.
410 - 4. They have a notched beak for the facial side and an unnotched beak for the lingual side of the tooth.
410 - 5. They are shaped so that the beaks may be placed on the tooth and still be parallel with the long axis of the tooth.
410 - 6. B, E, F.
410 - 7. A, C, G, H.
410 - 8. D.
410 - 9. A.
410 - 10. F.
410 - 11. G.
410 - 12. B.
410 - 13. E.
410 - 14. F.
410 - 15. C.
410 - 16. H.

411 - 1. *c.*
411 - 2. *f.*
411 - 3. *e.*
411 - 4. *b.*
411 - 5. *a.*
411 - 6. *g.*
411 - 7. *d.*

412 - 1. Scalpels or Bard-Parkers.
412 - 2. Discard it.
412 - 3. *a.* #12.
b. #10 and #15.
c. #11.
412 - 4. Rongeur forceps.
412 - 5. The bone file.
412 - 6. To remove bone or to split teeth.
412 - 7. The Stout #1.
412 - 8. Surgical curettes.

413 - 1. B.
413 - 2. A.
413 - 3. C and E.
413 - 4. F.
413 - 5. D.
413 - 6. G.

414 - 1. The #4.
414 - 2. Bulb type and Luer type.
414 - 3. Irrigating syringes.
414 - 4. The surgical mallet.
414 - 5. Small, semicircular-shaped.
414 - 6. Silk.
414 - 7. It has forklike prongs.

415 - 1. B.
415 - 2. D, E.
415 - 3. A, C, F.
415 - 4. G.
415 - 5. C, D, E.
415 - 6. B.
415 - 7. F, A.

416 - 1. B.
416 - 2. E.
416 - 3. C, D, F.
416 - 4. A.
416 - 5. G.
416 - 6. C.
416 - 7. G.
416 - 8. D, F.
416 - 9. B.
416 - 10. E.
416 - 11. C.
416 - 12. A.

417 - 1. Root canal broach.
417 - 2. Root canal reamer.
417 - 3. Root canal file.
417 - 4. The file threads are finer and closer together.
417 - 5. One type has contra-angled working ends and the other has straight working ends.

418 - 1. The aluminum tray.
418 - 2. The compound knife.
418 - 3. The crown remover.
418 - 4. Methyl (wood) alcohol.
418 - 5. The roach carver.
418 - 6. The dental pliers.
418 - 7. The Beale #7 and the Gritman #31.
418 - 8. A rubber mixing bowl.
418 - 9. Collar and crown scissors.
418 - 10. Rim-lock impression trays.

CHAPTER 4

419 - 1. F.
419 - 2. T.
419 - 3. T.
419 - 4. T.
419 - 5. F.
419 - 6. F.
419 - 7. T.
419 - 8. F.
419 - 9. T.
419 - 10. T.
419 - 11. T.

420 - 1. Two silver alloy pellets and the amount of mercury recommended by the manufacturer.
420 - 2. You can vary the alloy-mercury ratio by interchanging the plungers.
420 - 3. Trituration.
420 - 4. Because of variations in consistency and shortened working time.
420 - 5. Inspect the capsule to make sure that it is clean and that it has a pestle.
420 - 6. Remove the pestle, replace the capsule on the

amalgamator, and operate the machine for 1 or 2 seconds.
420 - 7. To remove excess mercury from the amalgam.
420 - 8. Condensation.
420 - 9. The amalgam should be condensed before the chemical setting action begins to form crystals. Too much delay can produce a weakened amalgam.

421 - 1. The manufacturer.
421 - 2. Discard the dry mix and replace it with a proper mix. Adding mercury to a dry mix drastically reduces its compressive strength.
421 - 3. Overtrituration decreases the setting time and increases the shrinkage of the amalgam. Undertrituration increases the setting time, increases expansion, and weakens the alloy.
421 - 4. Contaminating the mix with moisture or other impurities.
421 - 5. Delayed and excessive expansion, lowered crushing strength, blister formation on the amalgam's surface, pain shortly after the filling is inserted.
421 - 6. Mulling in a moist palm, touching or handling amalgam with moist fingers, and triturating at temperatures below the dew point.
421 - 7. Remove the fragments by placing a few drops of mercury in the capsule and place it on the amalgamator for a few seconds.

422 - 1. Anterior teeth.
422 - 2. Silica.
422 - 3. To avoid any color change.
422 - 4. Phosphoric acid and water.
422 - 5. Loss of liquid causes slow setting.
422 - 6. Natural appearance, translucence, anticariogenic action, low thermal conductivity, and easy manipulation.
422 - 7. It is brittle, soluble in mouth fluids, has a low crushing strength, and contracts upon setting. These properties reduce its life expectancy.
422 - 8. A clean, dry, cool, glass slab and #142 spatula. The plastic measuring stick is optional. The temperature of the slab and spatula should not be below the dew point.
422 - 9. He uses a shade guide.
422 - 10. Divide it so that you end up with a half, a quarter, and two eighth portions of powder.
422 - 11. Using a folding motion and a small area of the slab, you should incorporate the powder into the liquid until the mixture has a putty-like consistency. Mixing time should not exceed 1 minute.
422 - 12. 4 to 6 minutes.
422 - 13. A clear plastic matrix strip.
422 - 14. One of the stellite plastic filling instruments.
422 - 15. It is coated with a silicate lubricant.

423 - 1. They are primarily used to restore anterior teeth and are particularly suitable for incisal restorations because of their crushing strength.
423 - 2. The composite material and a catalyst.
423 - 3. The binders are modified acrylates that bind the mix together during setting. The fillers are translucent mineral fibers that provide a light transmission system for adapting the color of the filling material to the surrounding tooth structure.
423 - 4. Paste.
423 - 5. It causes the composite restorative material to set or harden.
423 - 6. *a, b, f, g, h, j,* and *k.*
423 - 7. They are practically the same.

424 - 1. Zinc phosphate cement is used as a cementing agent for crowns, inlays, fixed partial dentures. It is also used as a temporary filling and as an insulating base under amalgam restorations.
424 - 2. Zinc oxide.
424 - 3. They are both composed of phosphoric acid and water, but the percentages of these constituents are different in the two liquids.
424 - 4. *b, c, d,* and *f.*
424 - 5. A clean, cool, dry glass slab and a #313 or #324 stainless steel spatula.
424 - 6. Approximately $1\frac{1}{2}$ minutes.
424 - 7. From $1\frac{3}{4}$ to 2 minutes.
424 - 8. The heat created by the chemical action of the material can injure the tooth pulp if it is not dissipated.
424 - 9. *a, b, e,* and *g.*

425 - 1. To protect the dental pulp from thermal, chemical, electrical, and any other possible sources of irritation.
425 - 2. Because it seems to stimulate the production of secondary dentin.
425 - 3. Simply place small, equal portions of the base and catalyst on the mixing pad and mix them together.
425 - 4. Sterile water or local anesthetic.
425 - 5. Place equal portions of the base material and the catalyst on the mixing pad and mix together.
425 - 6. Zinc acetate.
425 - 7. As much as possible.
425 - 8. Yes.
425 - 9. To partially insulate the tooth structures from certain chemicals and to temporarily seal the margins of restorations.
425 - 10. Add some of the thinner that is supplied with the liners and varnishes. This will return them to a usable consistency.

426 - 1. The self-curing form.
426 - 2. The powder is polymer and the liquid is monomer.
426 - 3. To fabricate acrylic resin crowns or veneer crowns.
426 - 4. To construct "customized" impression trays for final, detailed impressions.

427 - 1. Heat.
427 - 2. To form casts; construct matrices; attach casts to articulators; to be combined as a ingredient in certain high heat investments; and to make certain impressions.
427 - 3. The initial setting time is 5 to 12 minutes and the final set occurs in approximately 45 minutes.
427 - 4. Plaster of paris.
427 - 5. For pouring casts and dies, and flasking dentures for processing.
427 - 6. The initial set of a typical hydrocal mix is from 7 to 15 minutes. The final set is completed in approximately 45 minutes.

428 - 1. *b.*
428 - 2. *e.*
428 - 3. *d.*
428 - 4. *b.*
428 - 5. *c.*
428 - 6. *h.*
428 - 7. *f.*
428 - 8. *a.*

429 - 1. *c.*
429 - 2. *f.*
429 - 3. *d.*
429 - 4. *a.*
429 - 5. *b.*
429 - 6. *e.*

430 - 1. *c.*

430 - 2. *b.*
430 - 3. *e.*
430 - 4. *a.*
430 - 5. *f.*
430 - 6. *d.*

431 - 1. To make a negative reproduction of the patient's mouth. This negative reproduction is poured up with a gypsum product to make a positive reproduction called a cast.
431 - 2. *e.*
431 - 3. *a.*
431 - 4. *f.*
431 - 5. *d.*
431 - 6. *b.*
431 - 7. *c.*

432 - 1. They are saturated with antiseptics and inserted into the canal. They are never used as permanent root canal material.
432 - 2. It should be insoluble in tissue fluids, opaque to X rays, reasonably easy to remove, nonirritating to periapical tissues, nonabsorbent, and dimensionally stable after insertion.
432 - 3. As a root canal restorative material.
432 - 4. It shrinks when used with a solvent and is not always easily inserted into the root canal.
432 - 5. They are hard to remove from the canal.
432 - 6. The zinc oxide and eugenol type.
432 - 7. Gutta-percha is dissolved in chloroform or eucalyptol.

433 - 1. As a protective barrier and a soothing and healing agent, they treat dry sockets and act as a gingival bandage after periodontal surgery.
433 - 2. On patients whose surgery left some exposed bone or who are allergic to eugenol.
433 - 3. *d.*
433 - 4. *c.*
433 - 5. *b.*
433 - 6. *e.*
433 - 7. *a.*

434 - 1. *e.*
434 - 2. *h.*
434 - 3. *a.*
434 - 4. *c.*
434 - 5. *i.*
434 - 6. *f.*
434 - 7. *b.*
434 - 8. *g.*
434 - 9. *d.*

☆U.S. GOVERNMENT PRINTING OFFICE:1974– 640-059/312
AUGAFS, ALA (751273) Jan 75-2900

235

STOP— **1. MATCH ANSWER SHEET TO THIS EXERCISE NUMBER.** **2. USE NUMBER 1 OR NUMBER 2 PENCIL.**

98150 03 23

EXTENSION COURSE INSTITUTE
VOLUME REVIEW EXERCISE

DENTAL INSTRUMENTS AND MATERIALS

Carefully read the following:

DO'S:

1. Check the "course," "volume," and "form" numbers from the answer sheet address tab against the "VRE answer sheet identification number" in the righthand column of the shipping list. If numbers do not match, take action to return the answer sheet and the shipping list to ECI immediately with a note of explanation.
2. Note that numerical sequence on answer sheet alternates across from column to column.
3. Use a medium sharp #1 or #2 black lead pencil for marking answer sheet.
4. Circle the correct answer in this test booklet. After you are sure of your answers, transfer them to the answer sheet. If you *have* to change an answer on the answer sheet, be sure that the erasure is complete. Use a clean eraser. But try to avoid any erasure on the answer sheet if at all possible.
5. Take action to return entire answer sheet to ECI.
6. Keep Volume Review Exercise booklet for review and reference.
7. If *mandatorily* enrolled student, process questions or comments through your unit trainer or OJT supervisor.
   If *voluntarily* enrolled student, send questions or comments to ECI on ECI Form 17.

DON'TS:

1. Don't use answer sheets other than one furnished specifically for each review exercise.
2. Don't mark on the answer sheet except to fill in marking blocks. Double marks or excessive markings which overflow marking blocks will register as errors.
3. Don't fold, spindle, staple, tape, or mutilate the answer sheet.
4. Don't use ink or any marking other than a #1 or #2 black lead pencil.

NOTE: NUMBERED LEARNING OBJECTIVE REFERENCES ARE USED ON THE VOLUME REVIEW EXERCISE. In parenthesis after each item number on the VRE is the *Learning Objective Number* where the answer to that item can be located. When answering the items on the VRE, refer to the *Learning Objectives* indicated by these *Numbers*. The VRE results will be sent to you on a postcard which will list the *actual* VRE *items you missed*. Go to the VRE booklet and locate the *Learning Objective Numbers* for the items missed. Go to the text and carefully review the areas covered by these references. Review the entire VRE again before you take the closed-book Course Examination.

10-1

213

Multiple Choice

1. (400) The working part of a condensing instrument is called the

   a. shank.
   b. blade.
   c. nib.
   d. head.

2. (400) The identification number of a single-ended dental instrument is usually found on the

   a. inner portion of the instrument's shank.
   b. portion of the handle nearest the working end.
   c. portion of the handle farthest from the working end.
   d. dorsal aspect of the instrument's working end.

3. (401) Which type of mouth mirror produces the most accurate image of the item being reflected?

   a. Magnifying surface.
   b. Polished steel surface.
   c. Back reflective surface.
   d. Front reflective surface.

4. (401) Which instrument is designed to detect small cavities and to determine the margin quality of restorations?

   a. Explorer.
   b. Vitalometer.
   c. Transilluminator.
   d. Periodontal probe.

5. (401) Which diagnostic aid actually passes an electric current to a tooth?

   a. Explorer.
   b. Vitalometer.
   c. Transilluminator.
   d. Dental X-ray unit.

6. (402) Friction grip burs are secured in the handpiece by

   a. screwing them into the handpiece.
   b. tightening the expansion walls of the handpiece.
   c. friction created against the latch top of the handpiece.
   d. friction against the metal or plastic chuck located in the handpiece.

7. (402) Which shape of bur is designed to gain entrance into the tooth and remove decayed tooth substance?

   a. Round.
   b. Inverted cone.
   c. Tapered fissure.
   d. Straight fissure.

8. (402) Which bur is best suited to make undercuts in the cavity preparation?

   a. Round.
   b. Inverted cone.
   c. Tapered fissure.
   d. Straight fissure.

9. (402) All of the following are shapes which apply to finishing burs except the

   a. bud.
   b. oval.
   c. round.
   d. inverted cone.

10. (403) What name applies to an abrasive disk that only has one side covered with an abrasive?

    a. Safe-sided disk.
    b. Plain-sided disk.
    c. One-surfaced disk.
    d. Slick-surfaced disk.

11. (403) The large wheel-type chamois polishers are primarily designed for use

    a. on cavity preparations.
    b. during oral prophylaxis.
    c. on amalgam restorations.
    d. in the dental laboratory.

12. (404) A small "harpoon" located on the plunger of a syringe identifies the syringe as

    a. an aspirating syringe.
    b. an irrigating syringe.
    c. a Luer lok syringe.
    d. a bulb-type syringe.

13. (404) The instrument commonly referred to as a Boley gauge is the

    a. dentimeter.
    b. endodontic probe.
    c. vernier caliper.
    d. periodontal probe.

14. (405) Which restorative chisels have slightly curved shanks?

    a. Biangles.
    b. Straight.
    c. Wedelstaedts.
    d. Delta-shaped.

15. (405) The instrument used on the walls of a cavity preparation to help establish a sharp cavity outline is the

    a. hoe.
    b. hatchet.
    c. spoon excavator.
    d. gingival margin trimmer.

16. (405) Which of the following instruments has a bi-beveled cutting end?

    a. Hoe.
    b. Chisel.
    c. Hatchet.
    d. Gingival margin trimmer.

17. (405) The instruments which carry the identification numbers 29 and 34 are the

    a. hoes.
    b. chisels.
    c. hatchets.
    d. spoon excavators.

18. (405) Spoon-type excavators are primarily used to

    a. carve wax inlay patterns.
    b. carve amalgam restorations.
    c. smooth the floor of a cavity preparation.
    d. remove carious debris from tooth cavities.

19. (406) Devices which are used to hold metal bands firmly around a tooth, thereby forming a temporary mold for filling materials, are called

    a. wedges.
    b. templates.
    c. band formers.
    d. matrix retainers.

20. (406) Which item is used to force a matrix band tightly against irregular tooth surfaces to eliminate spaces that could result in an overhanging restoration?

    a. Wedge.
    b. Crown former.
    c. Cotton pellet.
    d. Matrix retainer.

21. (406) Which type of strip matrix material is used in conjunction with silicate or resin filling materials?

    a. Copper.
    b. Plastic.
    c. Copper nickel.
    d. Stainless steel.

22. (406) Which type of matrix is used to hold filling materials firmly in place on the facial necks of anterior teeth?

a. Cervical matrices.
b. Ivory retainers.
c. Plastic crowns.
d. Copper bands.

23. (406) Which type of dental matrices would be used in conjunction with an impression material?

a. Copper bands.
b. Matrix crowns.
c. Plastic strips.
d. Ivory retainers.

24. (407) What name applies to instruments used to pack amalgam into cavity preparations?

a. Spatulas.
b. Carriers.
c. Condensers.
d. Burnishers.

25. (407) What instrument is used to remove scratches and to smooth and polish a freshly packed amalgam restoration?

a. Carver.
b. Burnisher.
c. Finishing file.
d. Finishing knife.

26. (407) Which instrument would be used to remove the overhang of a hardened metallic restoration?

a. Carver.
b. Burnisher.
c. Periodontal scaler.
d. Margin finishing file.

27. (407) The instrument used to hold, place, and drive amalgam pins into the tooth's dentin is called a

a. pin driver.
b. wedge holder.
c. pinhole drill.
d. restorative mallet.

28. (408) Which spatula is suitable for mixing silicate cement?

a. #31.
b. #142.
c. #313.
d. #324.

29. (408) Which plastic filling plugger is best suited for handling restorative resins and silicate cement?

a. #1—2.
b. Gregg #2.
c. Woodson #1.
d. Ladmore #3.

30. (409) Which instrument does the gold-foil carrier most closely resemble?

a. Rhein file.
b. #23 explorer.
c. #15 burnisher.
d. Amalgam carrier.

31. (410) Which of the following is not a part of a tooth extracting forceps?

a. Nib.
b. Neck.
c. Beaks.
d. Handle.

32. (410) What tooth extracting forceps is particularly effective for removing maxillary cuspids?

a. #1.
b. #88L.
c. MD #3.
d. #217.

33. (410) What teeth are the tooth extracting forceps #88L and #88R designed to remove?

a. Mandibular bicuspids.
b. Mandibular molars.
c. Maxillary molars.
d. Maxillary cuspids.

34. (410) Identify the mandibular tooth extracting forceps that are often referred to as the "cowhorns."

a. #1.
b. #16.
c. #53R.
d. MD #3.

35. (411) Which forceps used in oral surgery have a graduated, notched, locking device located near the ends of the handles?

a. Tissue.
b. Dressing.
c. Instrument.
d. Needle holder.

36. (411) Which forceps are designed to control hemorrhage by clamping or constricting blood vessels?

a. Gauze.
b. Tissue.
c. Hemostatic.
d. Towel-clamp.

37. (411) Which forceps used in the oral surgery section have two ring-shaped beaks?

a. Gauze.
b. Tissue.
c. Dressing.
d. Hemostatic.

38. (412) What instrument is used to trim the projecting, uneven, or overhanging alveolar bone that is often the result of a multiple extraction procedure?

a. Tissue forceps.
b. Rongeur forceps.
c. Surgical scissors.
d. Hemostatic forceps.

39. (412) Surgical scissors with a saw-toothed cutting edge are designed to cut

a. gauze sponges.
b. alveolar bone.
c. suture material.
d. soft oral tissues.

40. (412) If the oral surgeon called for a Seldin #11, what instrument would you pass him?

a. Curette.
b. Bone file.
c. Crossbar elevator.
d. Periosteal elevator.

41. (412) What surgical instruments are used to clean out infected cavities in bone and to remove debris from tooth sockets?

a. Curettes.
b. Elevators.
c. Bone files.
d. Rongeur forceps.

42. (413) Which surgical elevator would the oral surgeon use to lift or elevate a fractured zygoma?

a. Root.
b. Malar.
c. Crossbar.
d. Periosteal.

43. (413) What type of elevator is the Seldin #23?

a. Root.
b. Malar.
c. Crossbar.
d. Periosteal.

44. (413) Which elevator has a handle that is set at 90° in relation to its shank?

a. Malar.
b. Stout A.
c. Crossbar.
d. Pericsteal.

45. (414) The Luer syringe is used during oral surgery procedures to

a. inject the anesthetic.
b. aspirate the surgical site.
c. flush bone chips and blood from the field of vision.
d. apply disinfectant solution post-operatively to the surgical site.

46. (414) The shape of suture needles used by most oral surgeons is

a. hooked.
b. circular.
c. straight.
d. semicircular.

47. (414) What type of suture material is most commonly used in oral surgery procedures?

a. Silk.
b. Nylon.
c. Catgut.
d. Cotton.

48. (415) Which type of scaler is designed to function when used with a push-type motion?

a. "B."
b. Zerfing.
c. Jacquette #3.
d. Younger-Good #15.

49. (415) Which of the following scalers is designed primarily for use on posterior teeth?

a. "B."
b. Zerfing.
c. Jacquette #3.
d. Younger-Good #15.

50. (415) What action produced in the ultrasonic prophylaxis handpiece inserts is effective for removing calculus from tooth surfaces?

a. Heating.
b. Flushing.
c. Rotating.
d. Vibrating.

51. (416) The primary purpose of periodontal curettes is the removal of

a. subgingival calculus.
b. supragingival calculus.
c. debris from tooth sockets.
d. stains from coronal tooth surfaces.

52. (416) Which type of files are designed to smooth roughened cementum on root surfaces?

a. Bone.
b. Root canal.
c. Periodontal.
d. Margin-finishing.

53. (416) What instruments are used to accurately determine the presence, depth, and form of periodontal pockets?

a. Probes.
b. Curettes.
c. Explorers.
d. Pocket-marking forceps.

54. (416) The instruments used to perforate gingival tissue and thereby provide a reference line for the excision of excess gingival tissue are periodontal

a. probes.
b. knives.
c. curettes.
d. pocket-marking forceps.

55. (417) The endodontic instrument used to clear the pulp canal of soft tissues is the root canal

a. file.
b. reamer.
c. broach.
d. plugger.

56. (417) Which sequence of root canal instruments indicates the order in which they would normally be used?

a. File, reamer, broach, plugger.
b. Broach, plugger, reamer, file.
c. Reamer, broach, file, plugger.
d. Broach, reamer, file, plugger.

57. (418) Which type of impression tray should you select for making use of hydrocolloid impression materials?

a. Stainless steel.
b. Rim-lock.
c. Aluminum.
d. Sectional.

58. (418) Which prosthodontic knife has a fairly large red-plastic handle and uses detachable blades?

a. Plaster.
b. Compound.
c. Denture trimming.
d. Margin finishing.

59. (418) The Beebee curved and Quimby curved are examples of

a. fabric scissors.
b. surgical scissors.
c. periodontic scissors.
d. collar and crown scissors.

60. (418) The roach carver is primarily designed to carve

a. wax.
b. acrylic.
c. plaster.
d. resin materials.

61. (419) Why is amalgam primarily used to restore posterior teeth?

a. It is too soluble for use on anterior teeth.
b. Its crushing strength is not adequate for anterior teeth.
c. Its color makes it esthetically undesirable for anterior teeth.
d. Its mixing procedure is too time consuming for anterior teeth.

62. (419) Unused portions (scrap) of dental amalgam should be stored in

a. a lead-lined box.
b. a nonmetallic container.
c. an area of the clinic having adequate ventilation.
d. a vessel containing enough water to cover the amalgam.

63. (419) The American Dental Association established the maximum or minimum percentages for the metals in a silver alloy as not less than

a. 50 percent silver, and not more than 35 percent tin, 20 percent copper, and 5 percent zinc.
b. 60 percent silver and 30 percent tin, and not more than 8 percent copper and 2 percent zinc.
c. 65 percent silver, and not more than 29 percent tin, 6 percent copper, and 2 percent zinc.
d. 70 percent silver and 20 percent tin, and not more than 5 percent copper and 3 percent zinc.

64. (419) Which of the following is an undesirable property of amalgam?

a. Slow setting time.
b. High thermal conductivity.
c. Poor dimensional stability.
d. Poor discoloration resistance.

65. (420) Interchangeable plungers are supplied with the mercury dispenser to

a. allow you to change the alloy-mercury ratio.
b. provide a backup plunger in case one malfunctions.
c. permit periodic replacement of plungers that have been damaged by the mercury.
d. provide a means of changing the size of the mixture.

66. (420) Which of the following methods of mulling amalgam is acceptable?

a. Retriturate the mix for 10 seconds.
b. Roll the mix in your bare fingers for 5 seconds.
c. Roll the mix in the palm of your hand for 10 seconds.
d. Remove the pestle and revibrate the amalgam filled capsule for 2 seconds.

67. (420) The process of packing an amalgam into the cavity preparation is known as

a. filling.
b. building.
c. trituration.
d. condensation.

68. (421) If you add a drop of mercury to a partially set mix of amalgam, it

a. makes the mixture more homogenous.
b. adversely affects the color.
c. drastically reduces the crushing strength.
d. improves the marginal adaptation of the mix.

69. (421) Which of the following is a result of undertrituration of an amalgam?

a. Increased crushing strength.
b. Decreased setting time.
c. Increased expansion.
d. Increased shrinkage.

70. (421) All of the following may be the result of the moisture contamination of an amalgam except

a. pain.
b. blister formation.
c. decreased expansion.
d. lowered crushing strength.

71. (422) What is the main constituent of silicate cement powder?

a. Silica.
b. Alumina.
c. Fluorine.
d. Zinc oxide.

72. (422) An excess of moisture absorbed by the silicate cement liquid will affect the setting time of a silicate restoration by

a. preventing its setting.
b. causing faster setting.
c. causing a slightly slower setting.
d. causing a notable delay in setting.

73. (422) The most important property of silicate cement is that it

a. is insoluble in oral fluids.
b. has an anticariogenic action.
c. has a high crushing strength.
d. has a rate of thermal conductivity.

74. (422) Which spatula should be used to mix silicate cement?

a. #31.
b. #142.
c. #313.
d. #324.

75. (422) Silicate cement should be mixed

a. slowly over a large area of the slab.
b. with a rapid stirring motion over a small area of the slab.
c. rapidly with a folding motion over a large area of the slab.
d. quickly to a thick consistency with a folding motion.

76. (422) The entire mixing time for silicate cement should not exceed

a. 1 minute.
b. 2 minutes.
c. 45 seconds.
d. 1 1/2 minutes.

77. (423) Which filling material is best suited (both esthetically and functionally) for an incisal restoration?

a. Amalgam.
b. Silicate cement.
c. Zinc phosphate cement.
d. Composite filling material.

78. (423) An undesirable property of composite filling material is its

a. short shelf life.
b. anticariogenic action.
c. tendency for staining.
d. solubility in oral fluids.

79. (424) Zinc phosphate cement may be used for all of the following purposes except as

a. a pulp capping material.
b. an insulating base material.
c. a cementing agent for crowns.
d. a temporary filling material.

80. (424) The chief ingredient of zinc phosphate cement is

a. silica.
b. phosphate.
c. magnesium.
d. zinc oxide.

81. (424) A desirable property of zinc phosphate cement is its

a. insolubility in oral fluids.
b. expansion during setting.
c. low thermal conductivity.
d. high crushing strength.

82. (424) Which spatula is designed to mix zinc phosphate cement?

a. #7.
b. #31.
c. #142.
d. #324.

83. (424) Zinc phosphate cement should be mixed over a large area of the slab to

a. accelerate its normally slow setting time.
b. dissipate heat that could be injurious to the tooth's pulp.
c. increase the powder's liquid consumption for added strength.
d. provide the necessary liquid evaporation needed for setting.

84. (425) Calcium hydroxide powder is often mixed with sterile water and used as a pulp capping agent because of its ability to

a. achieve a cementing bond between the restoration and the tooth.
b. provide increased translucency to anterior restorations.
c. stimulate the production of secondary dentin.
d. seal the margins of the restoration.

85. (425) When you mix hard setting calcium hydroxide or zinc oxide pastes, you should use

a. equal portions of the base and catalyst together.
b. two portions of the catalyst to one portion of the base.
c. two portions of the base to one portion of the catalyst.
d. three portions of the base to one portion of the catalyst.

86. (425) Cavity liners and varnishes can best be classified as

a. bases.
b. sealers.
c. insulators.
d. restorations.

87. (426) Which term is used to identify the acrylic resin liquid?

a. Polymer.
b. Monomer.
c. Merrimac.
d. Methyl methacrylate.

88. (426) The primary use of self-curing denture base materials is for making

a. temporary crowns.
b. veneer facings for metallic crowns.
c. the base material for full dentures.
d. repairs on broken full or partial dentures.

89. (426) What is the usual color of impression tray resin?

a. Pink.
b. Clear.
c. Light blue or white.
d. Light pink or white.

90. (427) During the final solidification of gypsum products, the plaster gives off an appreciable amount of

a. heat.
b. odor.
c. vapor.
d. moisture.

91. (427) As compared to hydrocal, plaster of paris is

a. harder.
b. denser.
c. quite porous.
d. relatively nonporous.

92. (427) The initial set of a typical hydrocal mix is

a. from 1 to 3 minutes.
b. from 7 to 15 minutes.
c. about 30 minutes.
d. about 45 minutes.

93. (428) Which dental wax is used to construct occlusal rims?

a. Bite.
b. Inlay.
c. Utility.
d. Baseplate.

94. (428) Ivory inlay wax is used in preparing the wax patterns for

a. gold crowns.
b. gold inlays.
c. acrylic jackets.
d. full dentures.

95. (428) Which wax is used to bead impressions and provide a rimlock for impression trays?

a. Boxing.
b. Utility.
c. Baseplate.
d. Impression.

96. (429) Which term refers to the amount of bending and shaping a metal can sustain without breaking?

a. Hardness.
b. Ductility.
c. Malleability.
d. Specific gravity.

97. (430) Which type of gold is supplied in a particular gage?

a. Type 1.
b. Type 3.
c. Wrought.
d. Casting.

98. (430) Gold solders should melt and flow at

a. the same temperatures as the parts being joined.
b. slightly below the melting range of the parts being joined.
c. least 50° F. below the melting range of the parts being joined.
d. least 100° F. below the melting range of the parts being joined.

99. (430) Which of the following dental metals is used in its pure form?

a. Gold foil.
b. Gold solder.
c. Wrought gold.
d. Casting gold.

100. (431) Which type of impression material has a relatively short shelf life because of its unstable polysulfide base?

a. Impression wax.
b. Impression paste.
c. Rubber-base compound.
d. Alginate hydrocolloid.

101. (431) What is the proper mixing time for rubber-base impression material?

a. 15 to 30 seconds.
b. 45 to 60 seconds.
c. 60 to 90 seconds.
d. 90 to 120 seconds.

102. (431) Which of the following impression materials is a reversible material?

a. Impression paste.
b. Agar hydrocolloid.
c. Impression plaster.
d. Rubber-base compound.

103. (432) During root canal therapy, antiseptics are usually introduced into the canal by

a. the gutta percha points.
b. a saturated paper point.
c. the root canal cement.
d. a Luer syringe.

104. (432) A desirable characteristic of a good root canal filling material is that it be

a. difficult to remove.
b. radiolucent to X-rays.
c. soluble in oral fluids.
d. nonirritating to periapical tissues.

105. (432) An acceptable root canal paste for use as a sealer can be made by dissolving gutta percha in

a. creosote.
b. chloroform.
c. ethyl alcohol.
d. parachlorophenol.

106. (433) Surgical dressing is often used after periodontal surgery to serve as

a. a sterilizing agent.
b. a cauterizing agent.
c. a gingival bandage.
d. an anticoagulant.

107. (433) The zinc oxide and eugenol ingredients of a surgical pack serve to

a. soothe pain.
b. check bleeding.
c. provide strength.
d. provide esthetics.

108. (433) What function would be served by adding tannic acid to the ingredients of a surgical pack?

a. Harder setting.
b. Better flavor.
c. Checked bleeding.
d. More strength.

109. (434) What fabrication procedure requires the use of baseplate material?

a. Gold crown construction.
b. Porcelain crown construction.
c. Acrylic tray construction.
d. Bite-rim foundation construction.

110. (434) Which dental abrasive should be used to polish natural teeth?

a. Rouge.
b. Tripoli.
c. Coarse pumice.
d. Zirconium silicate.

98150 03 S01 7501

SUPPLEMENTARY MATERIAL

CDC 98150

DENTAL SPECIALIST

(AFSC 98150)

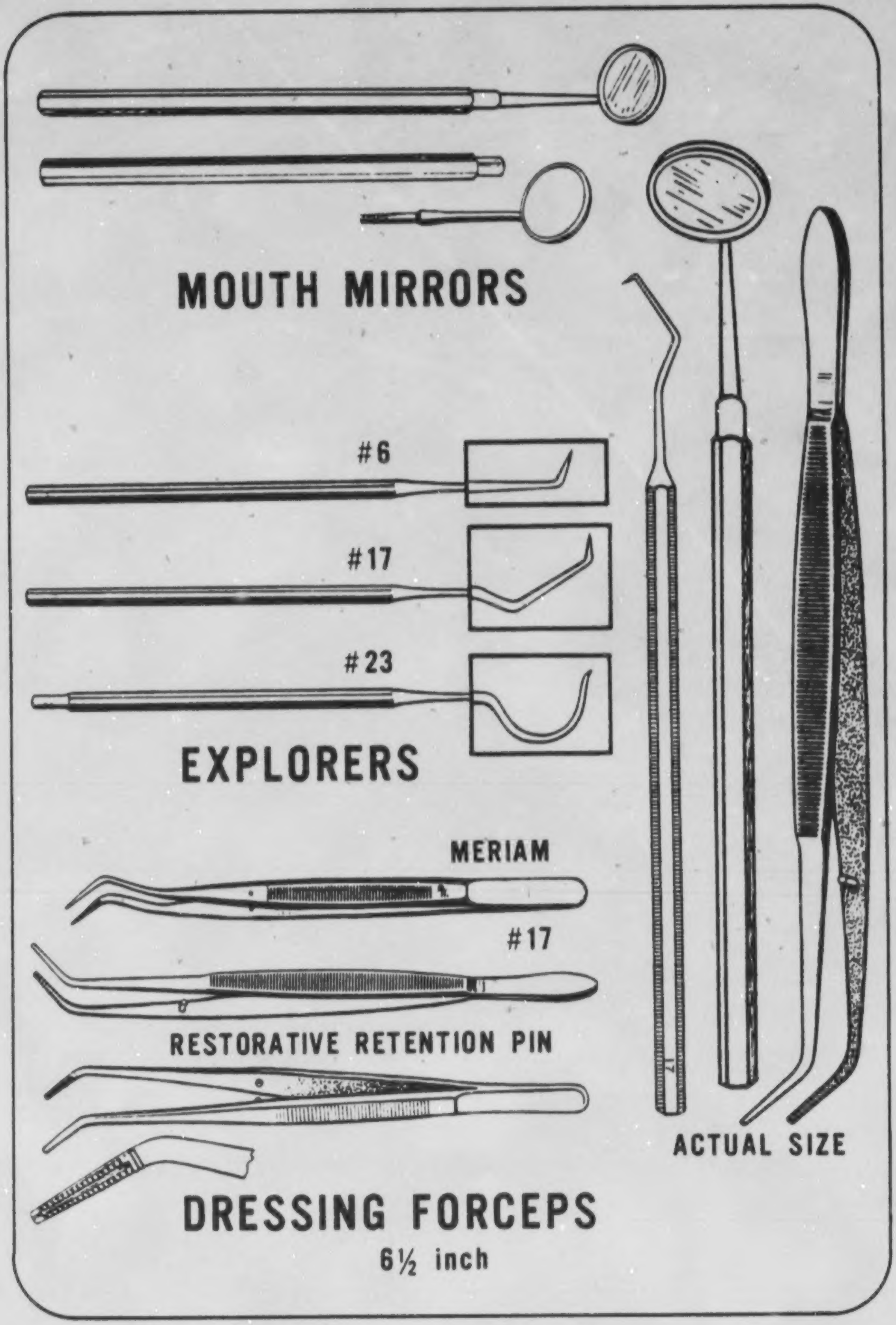
Volume 3

AU-GAFS, ALA. (751274)2900

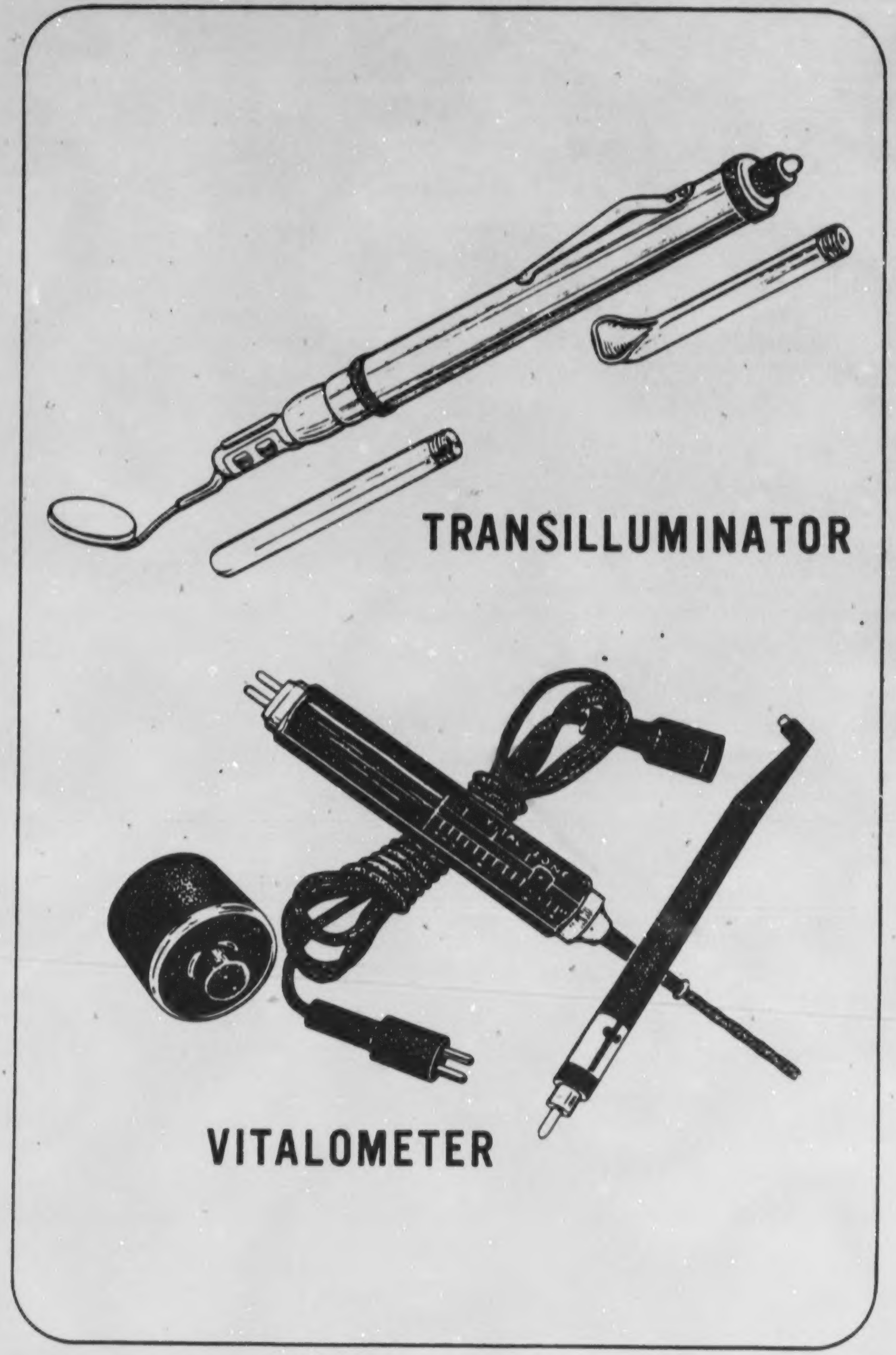
Foldouts 1-8

Extension Course Institute

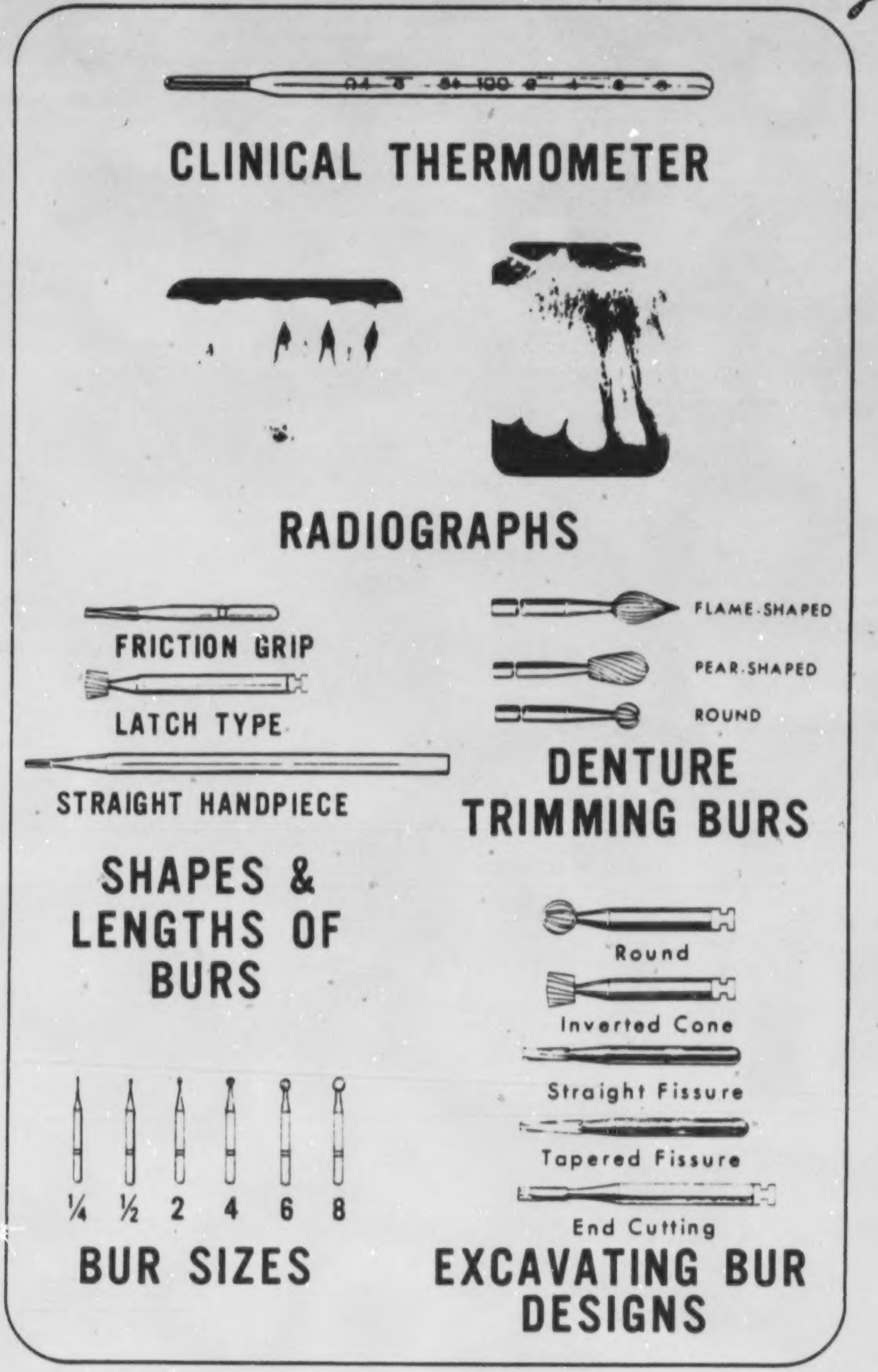
Air University


MOUTH MIRRORS
#6
#17
#23
EXPLORERS
MERIAM
#17
RESTORATIVE RETENTION PIN
DRESSING FORCEPS
6½ inch
ACTUAL SIZE

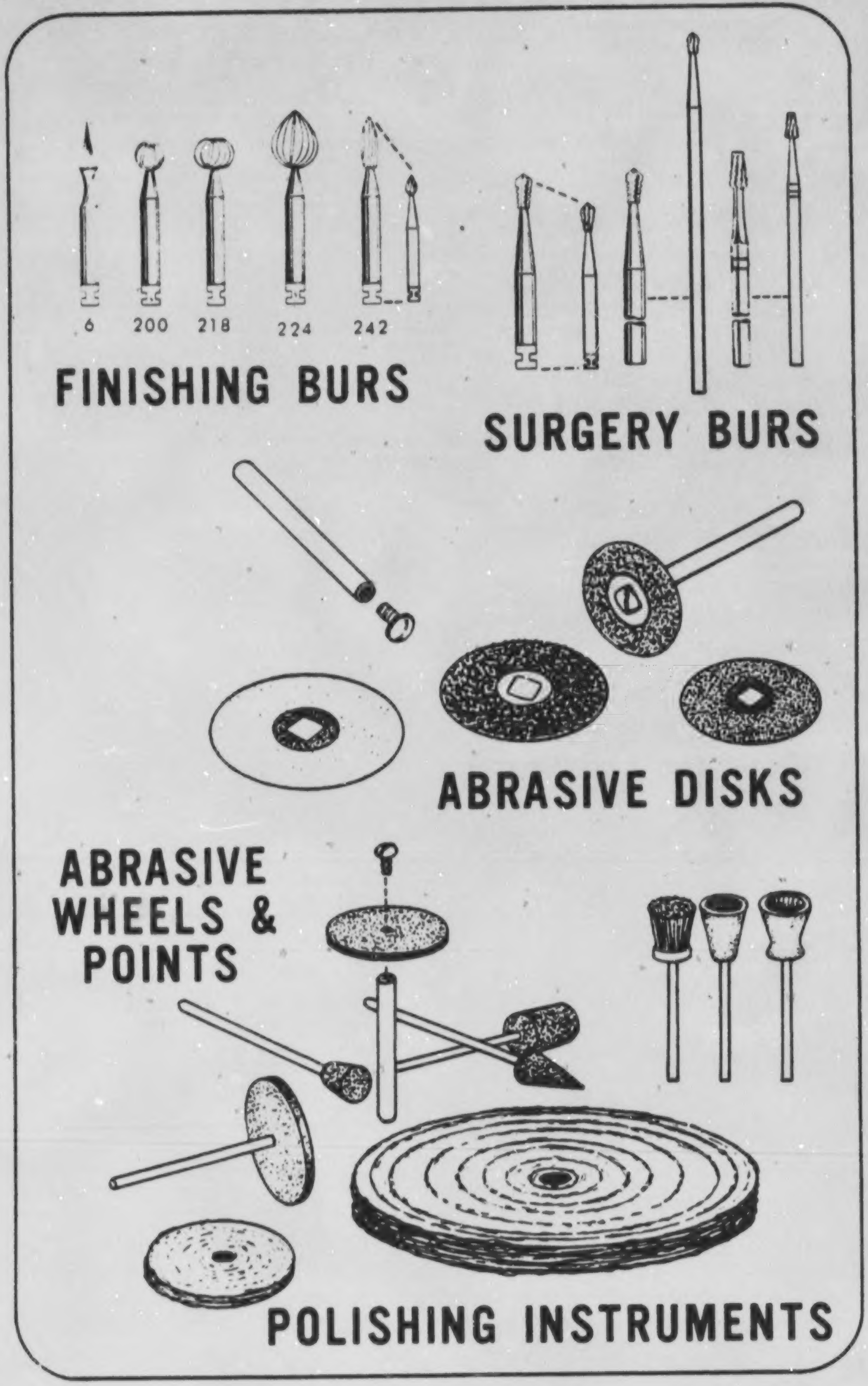
Foldout 1. Dental Instruments


TRANSILLUMINATOR
VITALOMETER

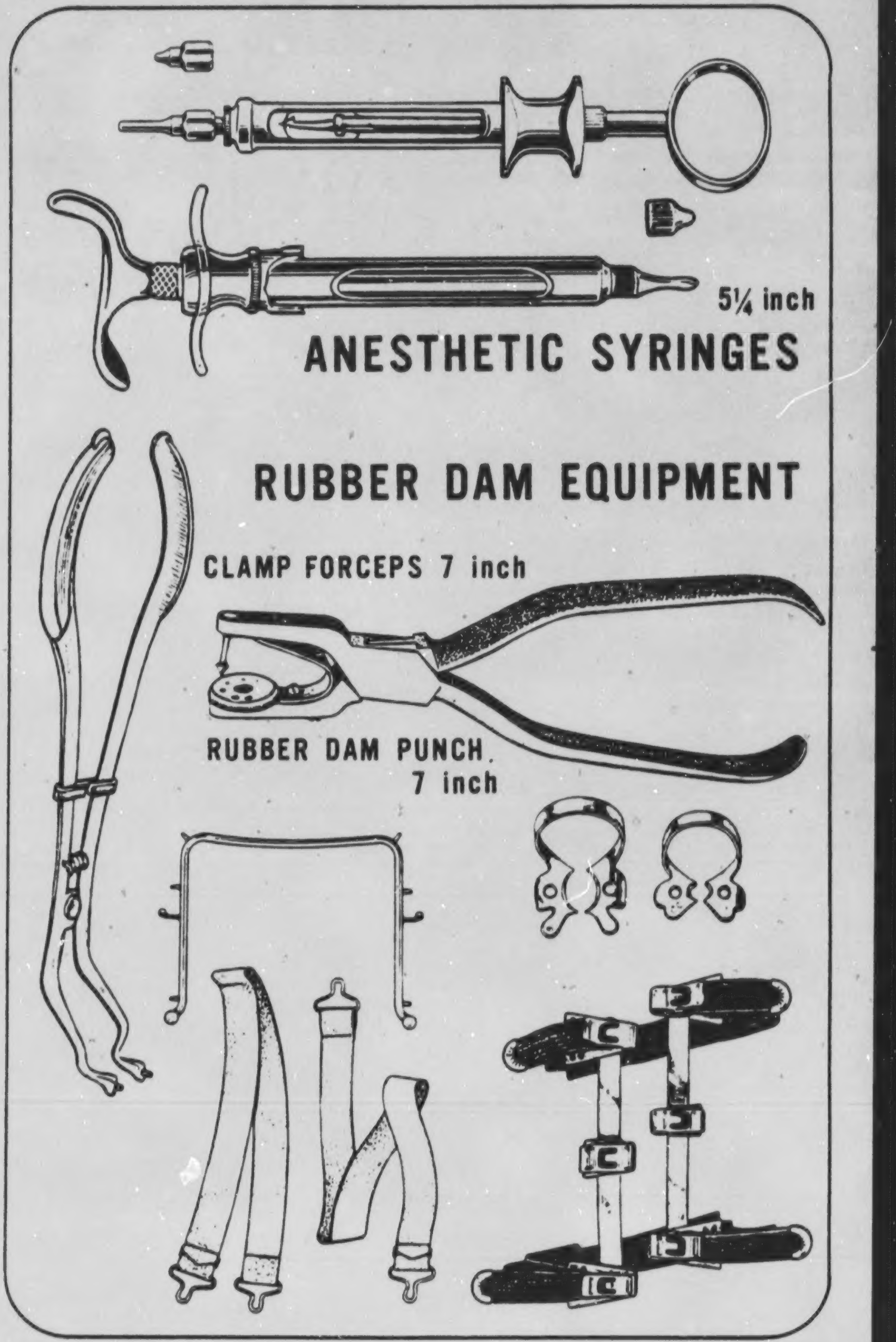
Foldout 1. Dental Instruments


CLINICAL THERMOMETER
RADIOGRAPHS
FRICTION GRIP
LATCH TYPE
STRAIGHT HANDPIECE
SHAPES & LENGTHS OF BURS
FLAME-SHAPED
PEAR-SHAPED
ROUND
DENTURE TRIMMING BURS
Round
Inverted Cone
Straight Fissure
Tapered Fissure
End Cutting
¼
½
2
4
6
8
BUR SIZES
EXCAVATING BUR DESIGNS

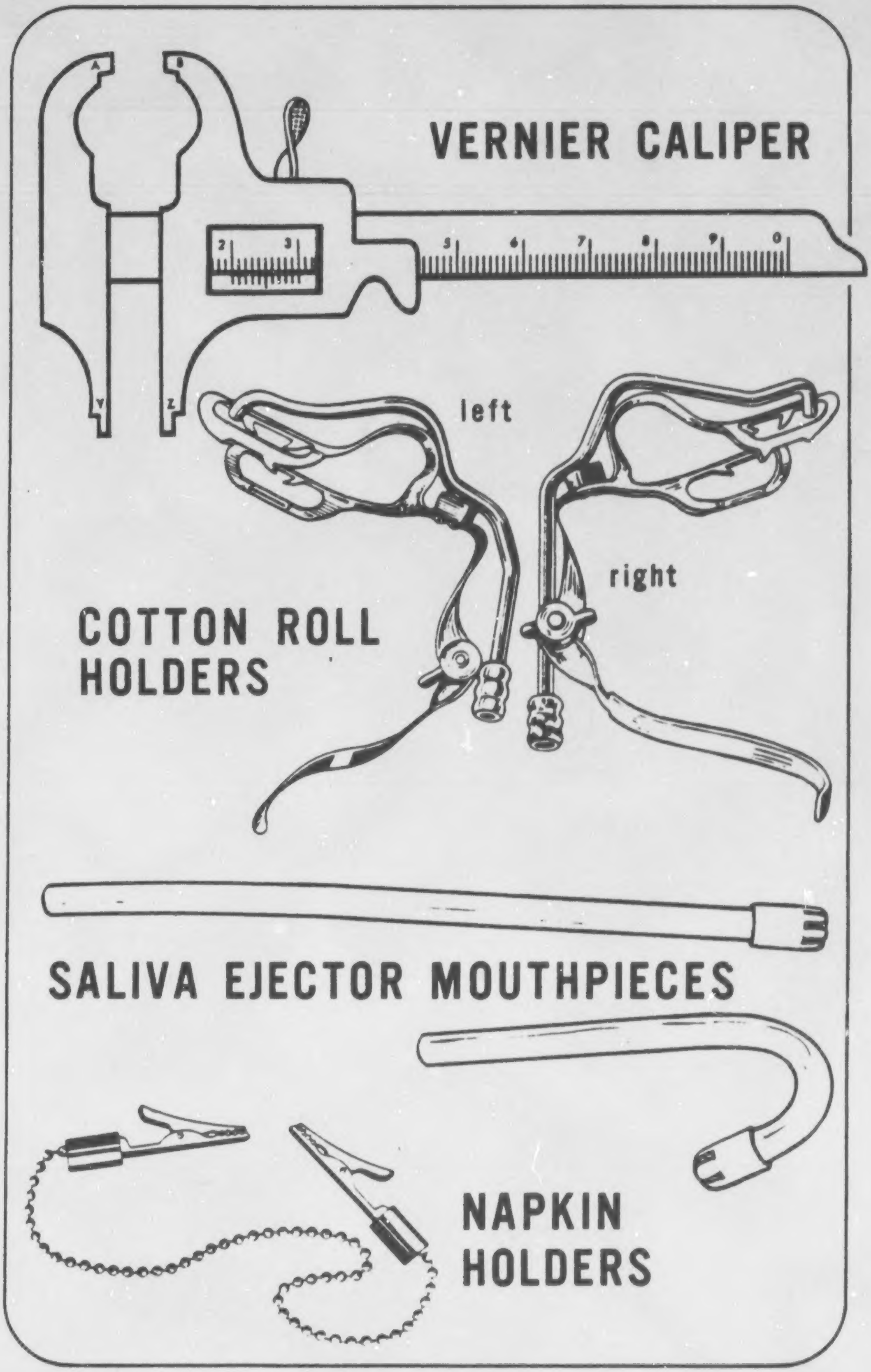
Foldout 1. Dental Instruments.


6
200
218
224
242
FINISHING BURS
SURGERY BURS
ABRASIVE DISKS
ABRASIVE WHEELS & POINTS
POLISHING INSTRUMENTS

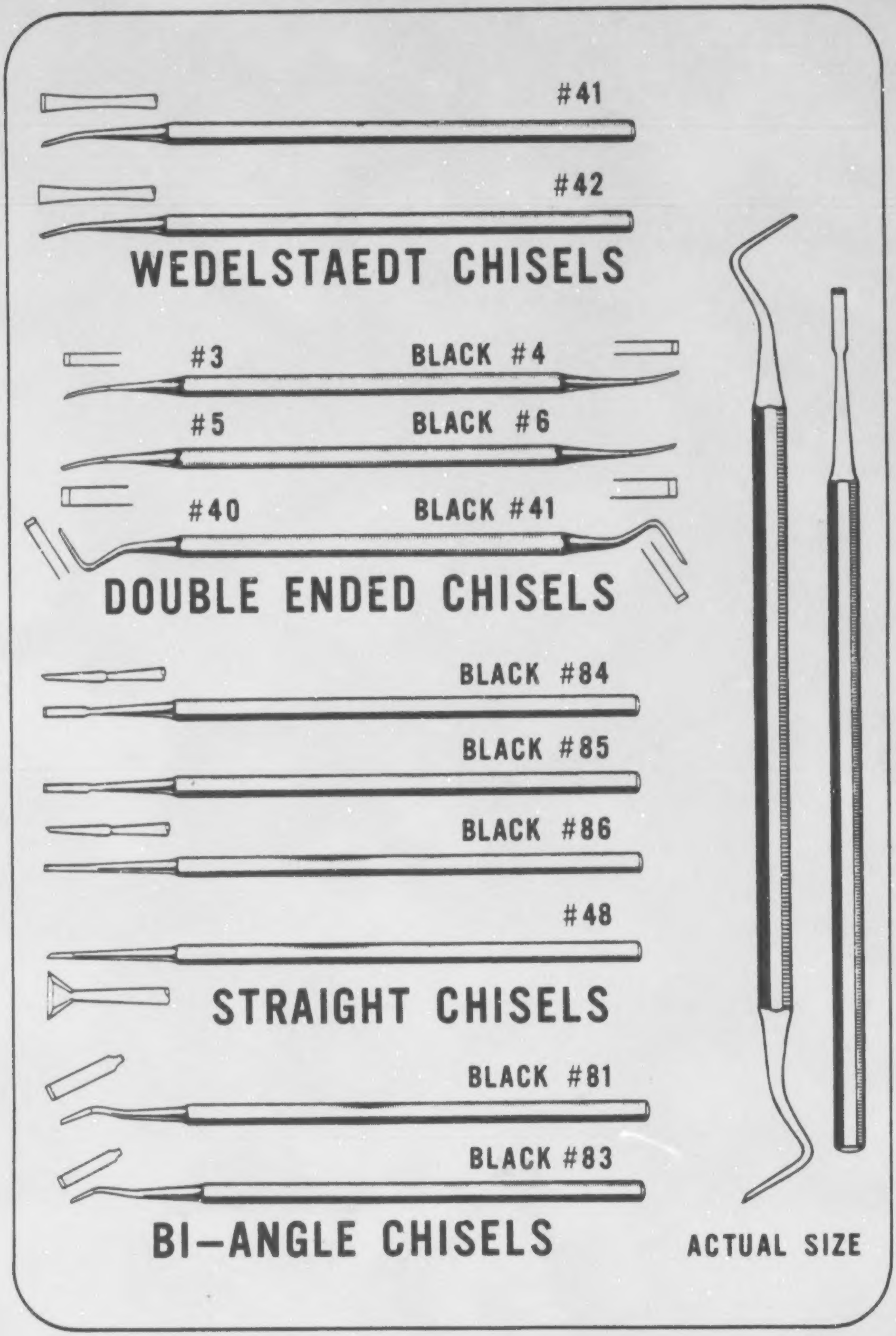
Foldout 1. Dental Instruments (cont'd)


5¼ inch
ANESTHETIC SYRINGES
RUBBER DAM EQUIPMENT
CLAMP FORCEPS 7 inch
RUBBER DAM PUNCH
7 inch

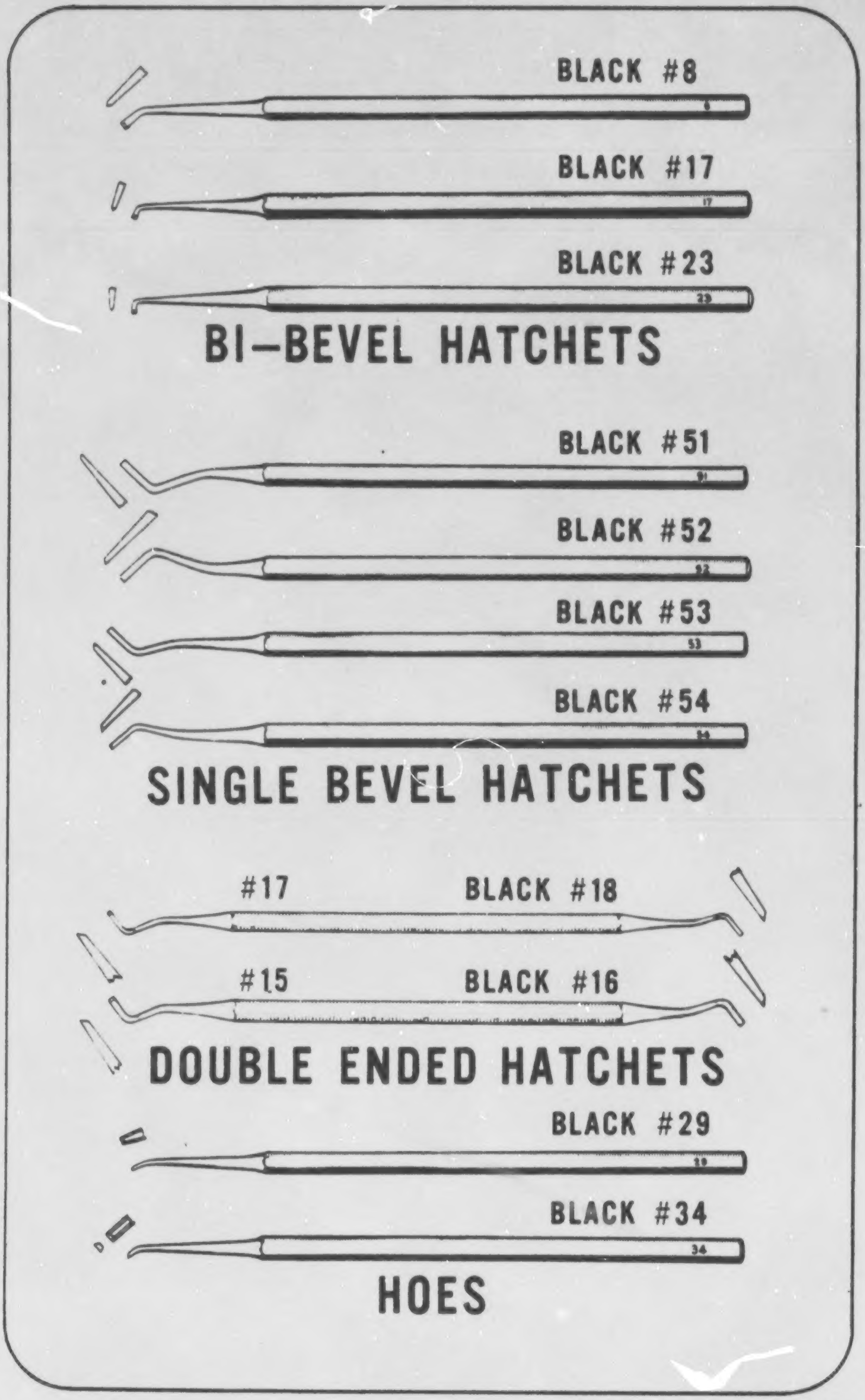
Foldout 1. Dental Instruments
(cont'd)


VERNIER CALIPER
A
B
2
3
5
6
7
8
9
0
Y
Z
left
right
COTTON ROLL HOLDERS
SALIVA EJECTOR MOUTHPIECES
NAPKIN HOLDERS

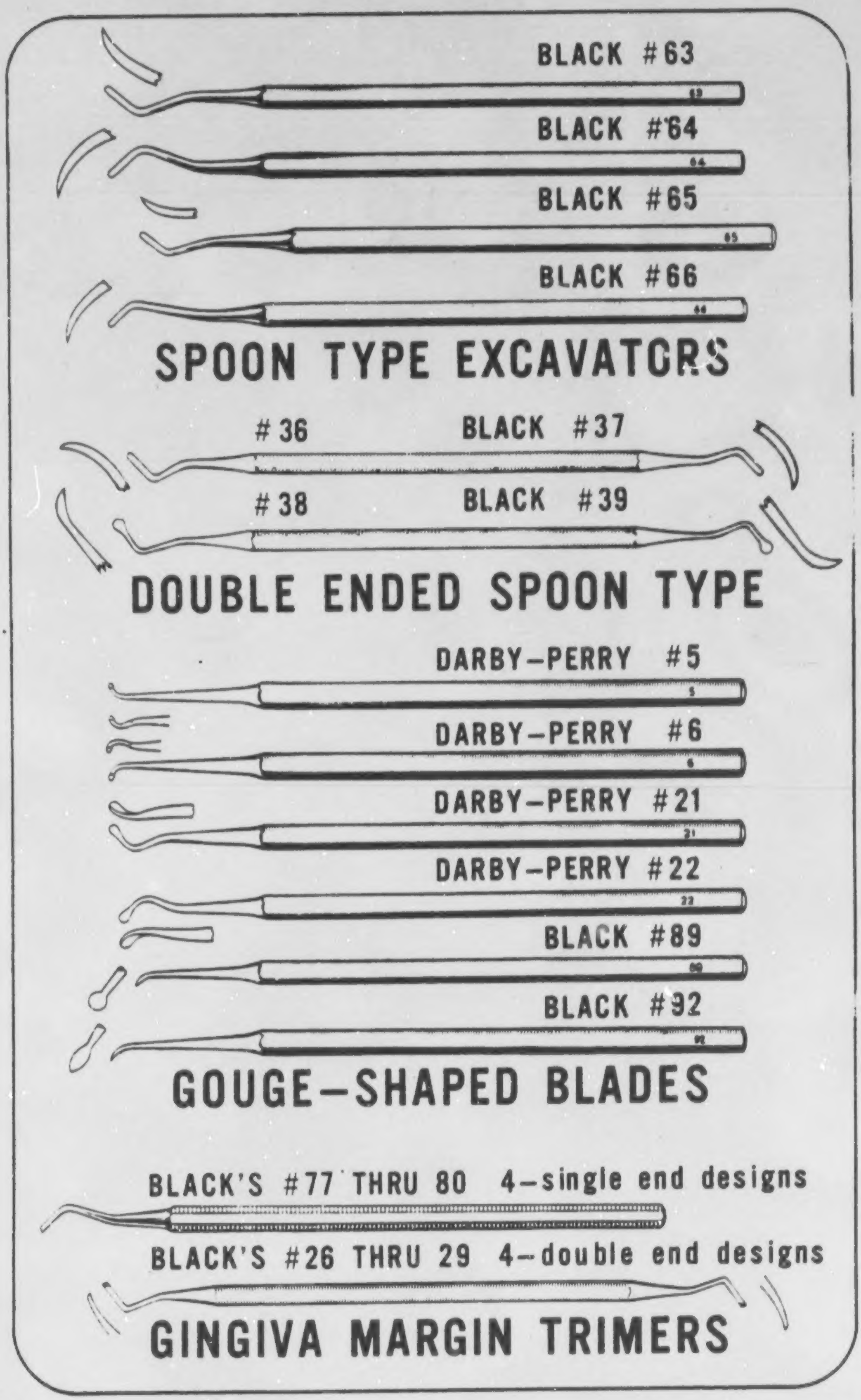
Foldout 1. Dental Instruments (cont'd).


#41
#42
WEDELSTAEDT CHISELS
#3
BLACK #4
#5
BLACK #6
#40
BLACK #41
DOUBLE ENDED CHISELS
BLACK #84
BLACK #85
BLACK #86
#48
STRAIGHT CHISELS
BLACK #81
BLACK #83
BI–ANGLE CHISELS
ACTUAL SIZE

Foldout 2. Dental Instruments

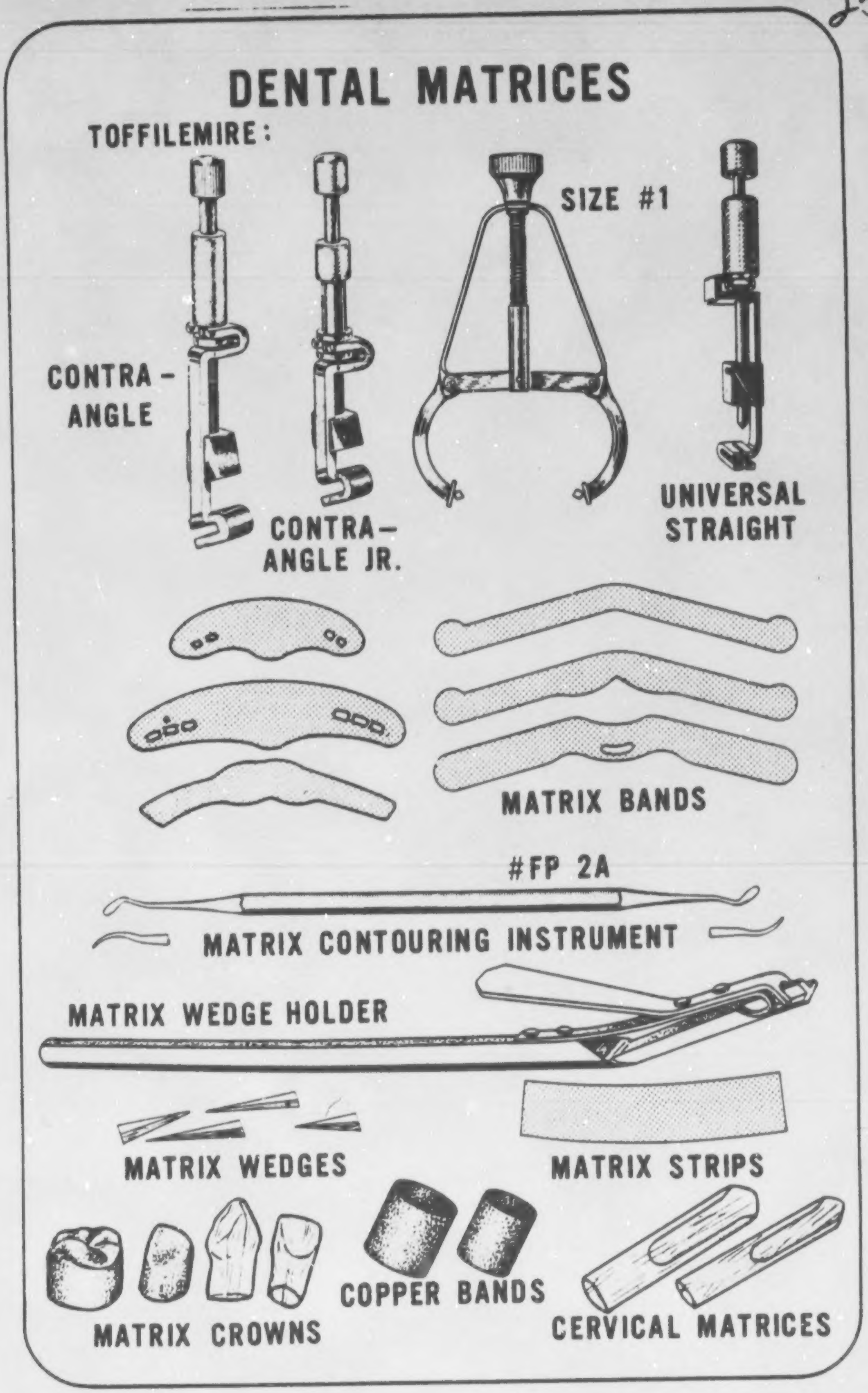

BLACK #8
BLACK #17
BLACK #23
BI-BEVEL HATCHETS
BLACK #51
BLACK #52
BLACK #53
BLACK #54
SINGLE BEVEL HATCHETS
#17
BLACK #18
#15
BLACK #16
DOUBLE ENDED HATCHETS
BLACK #29
BLACK #34
HOES

Foldout 2. Dental Instruments

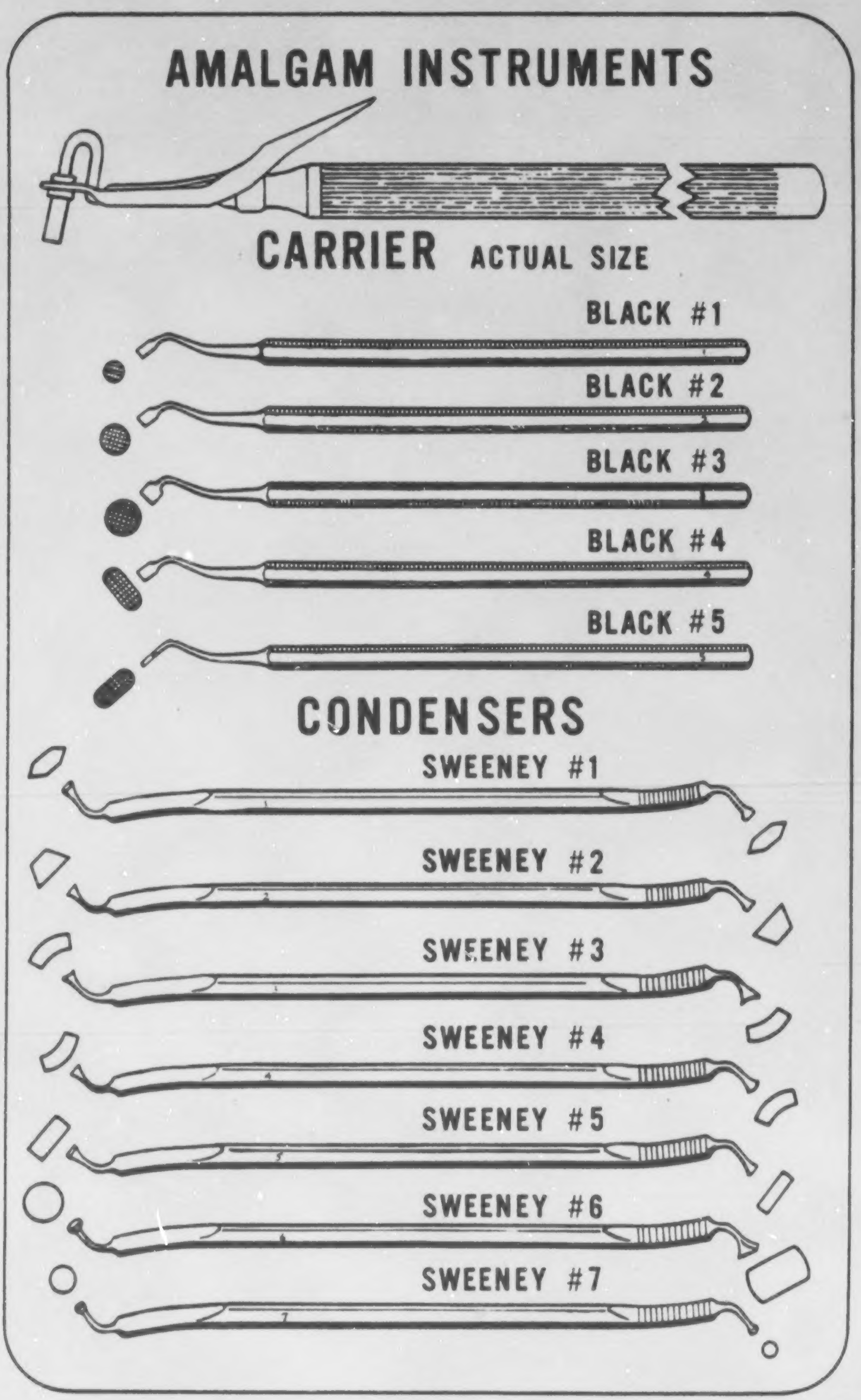

BLACK #63
BLACK #64
BLACK #65
BLACK #66
SPOON TYPE EXCAVATORS
# 36
BLACK #37
# 38
BLACK #39
DOUBLE ENDED SPOON TYPE
DARBY-PERRY #5
DARBY-PERRY #6
DARBY-PERRY #21
DARBY-PERRY #22
BLACK #89
BLACK #92
GOUGE-SHAPED BLADES
BLACK'S #77 THRU 80 4-single end designs
BLACK'S #26 THRU 29 4-double end designs
GINGIVA MARGIN TRIMERS

Foldout 2. Dental Instruments.

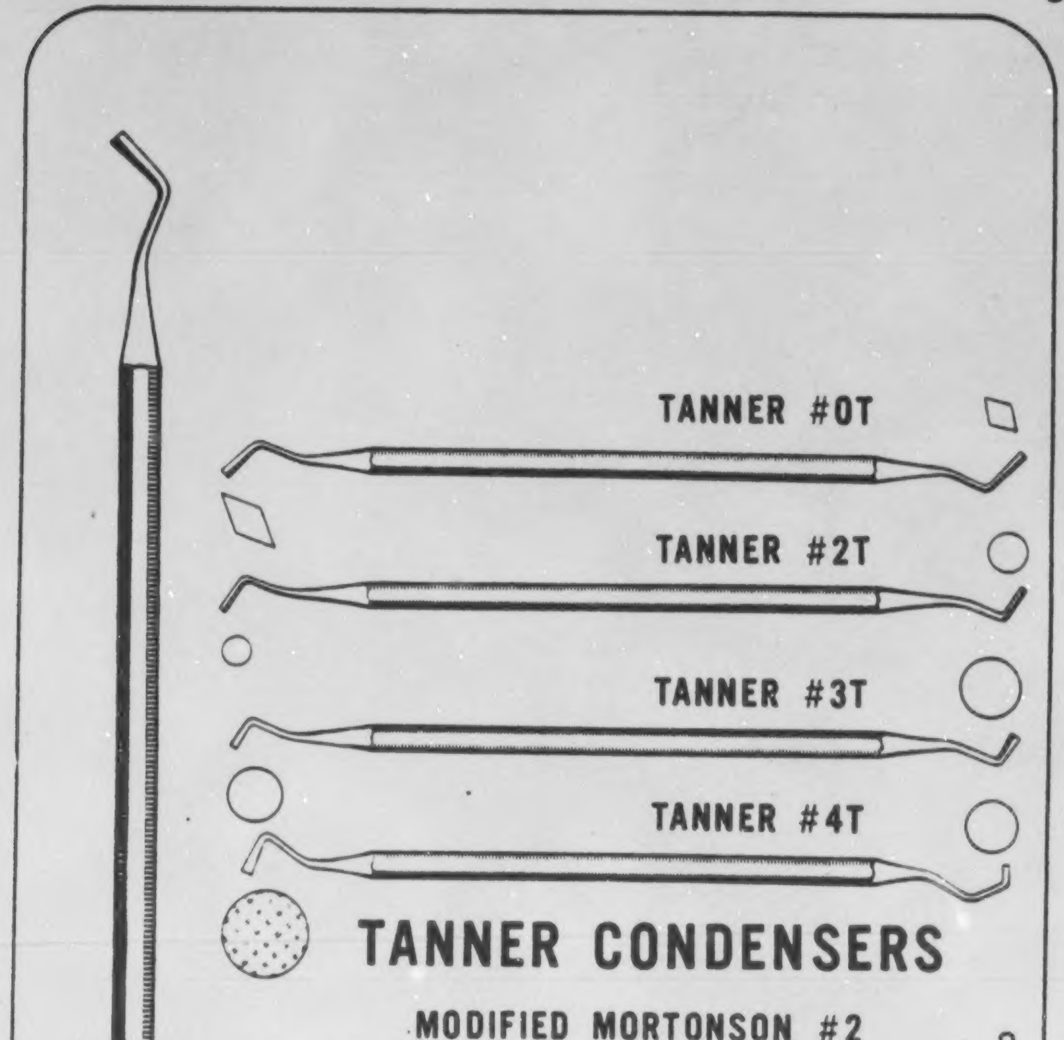
25


DENTAL MATRICES
TOFFILEMIRE:
CONTRA-ANGLE
CONTRA-ANGLE JR.
SIZE #1
UNIVERSAL STRAIGHT
MATRIX BANDS
#FP 2A
MATRIX CONTOURING INSTRUMENT
MATRIX WEDGE HOLDER
MATRIX WEDGES
MATRIX STRIPS
MATRIX CROWNS
COPPER BANDS
CERVICAL MATRICES

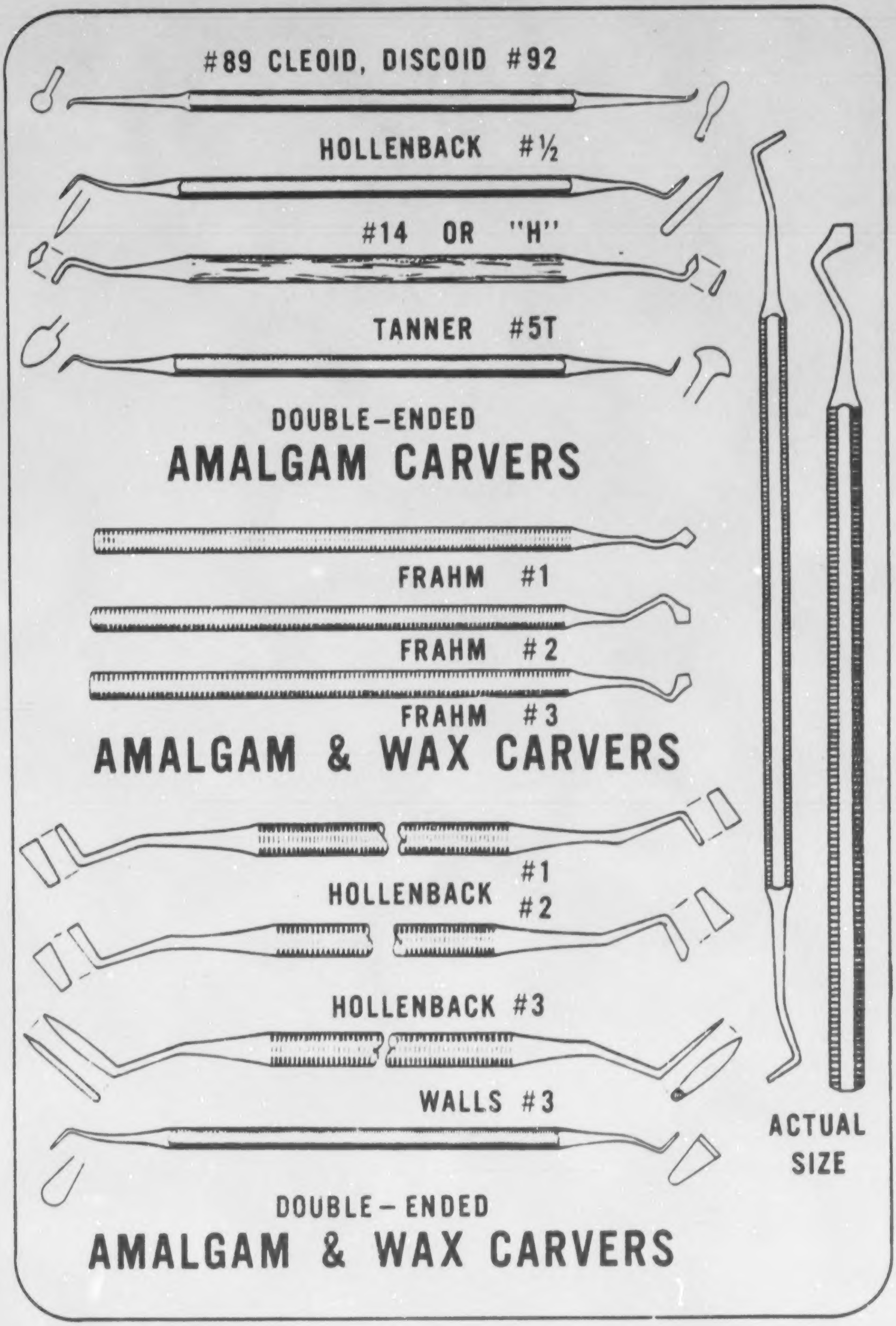
Foldout 2. Dental Instruments (cont'd)


AMALGAM INSTRUMENTS
CARRIER ACTUAL SIZE
BLACK #1
BLACK #2
BLACK #3
BLACK #4
BLACK #5
CONDENSERS
SWEENEY #1
SWEENEY #2
SWEENEY #3
SWEENEY #4
SWEENEY #5
SWEENEY #6
SWEENEY #7

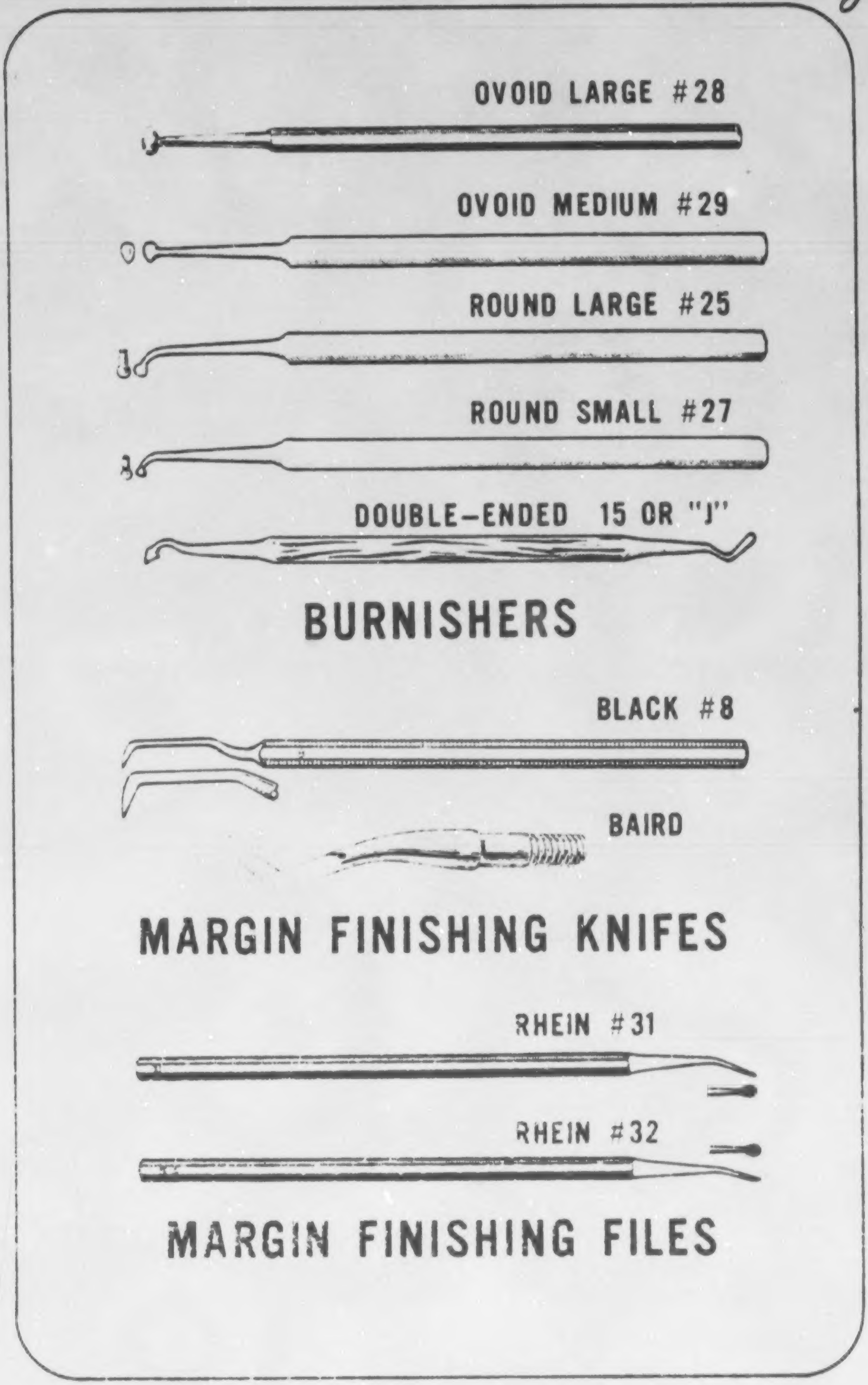
Foldout 2. Dental Instruments (cont'd


TANNER #0T
TANNER #2T
TANNER #3T
TANNER #4T
TANNER CONDENSERS
MODIFIED MORTONSON #2
TANNER #6TA
TANNER #6TB
SINGLE ENDED
AMALGAM CARVERS
ACTUAL
SIZE

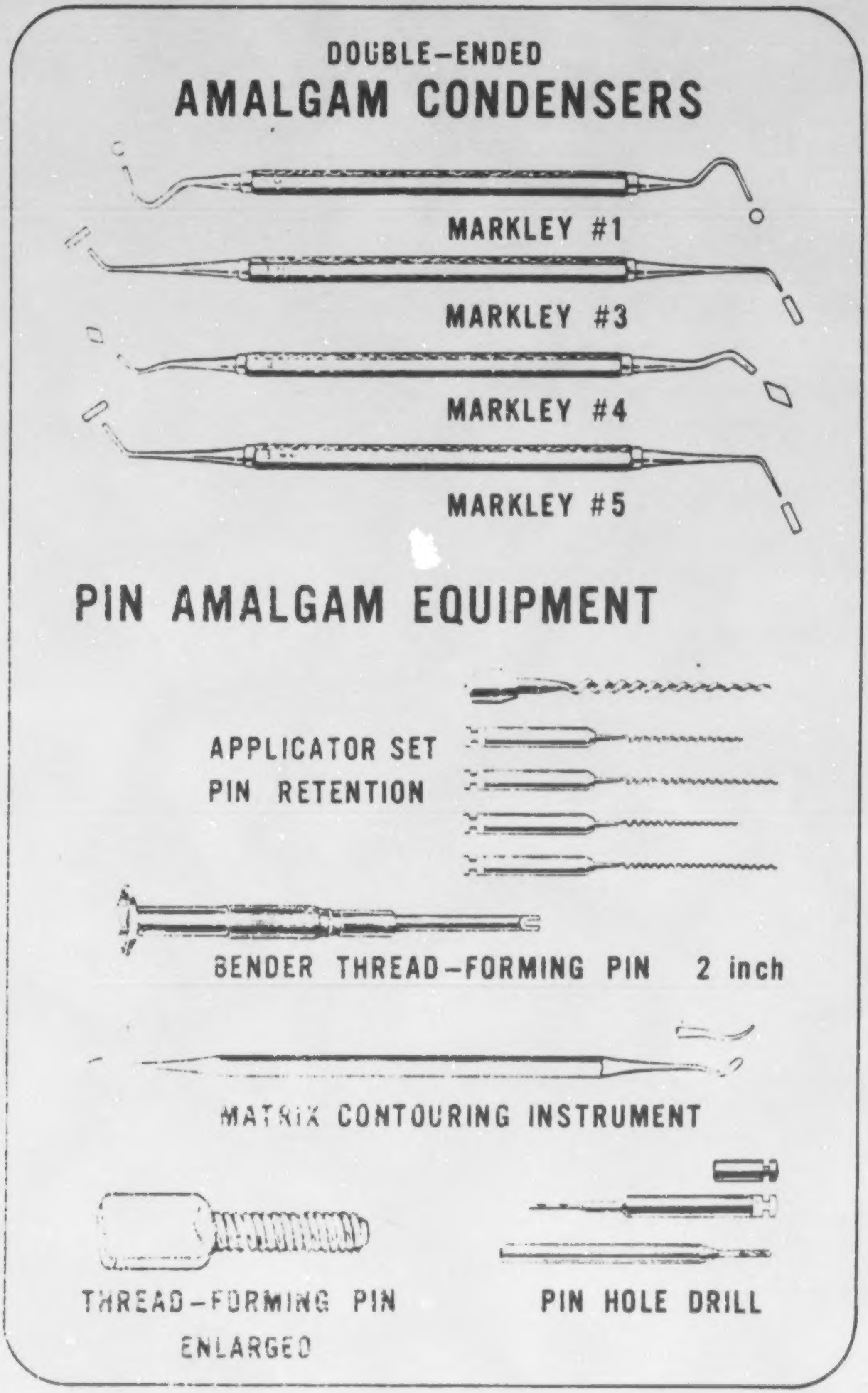
Foldout 2. Dental Instruments (cont'd).


#89 CLEOID, DISCOID #92
HOLLENBACK #½
#14 OR "H"
TANNER #5T
DOUBLE-ENDED
AMALGAM CARVERS
FRAHM #1
FRAHM #2
FRAHM #3
AMALGAM & WAX CARVERS
HOLLENBACK #1
#2
HOLLENBACK #3
WALLS #3
DOUBLE-ENDED
AMALGAM & WAX CARVERS
ACTUAL
SIZE

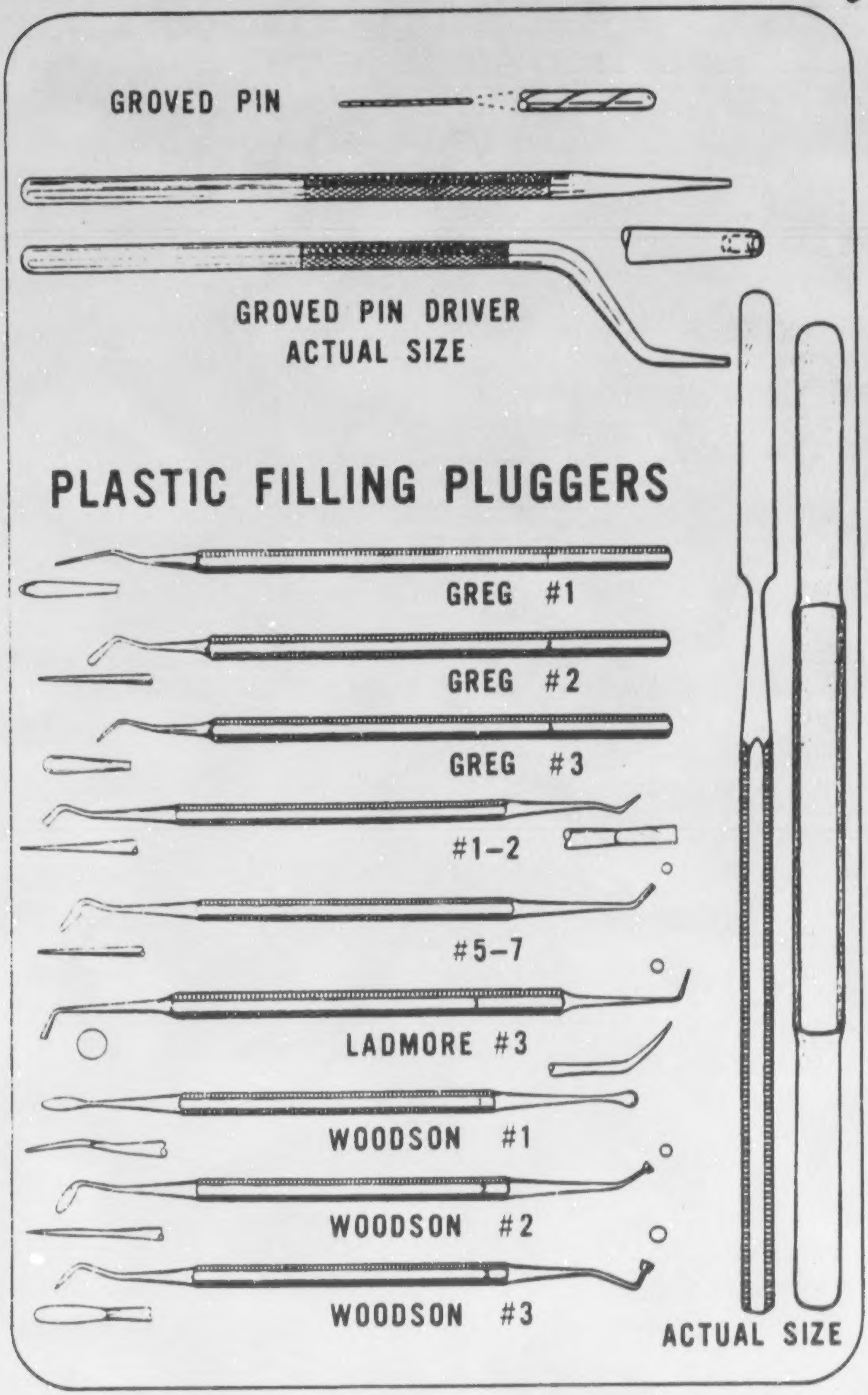
Foldout 3. Dental Instruments


OVOID LARGE #28
OVOID MEDIUM #29
ROUND LARGE #25
ROUND SMALL #27
DOUBLE-ENDED 15 OR "J"
BURNISHERS
BLACK #8
BAIRD
MARGIN FINISHING KNIFES
RHEIN #31
RHEIN #32
MARGIN FINISHING FILES

Foldout 3. Dental Instruments

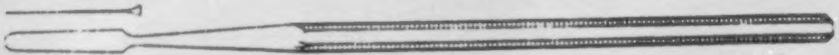

DOUBLE-ENDED
AMALGAM CONDENSERS
MARKLEY #1
MARKLEY #3
MARKLEY #4
MARKLEY #5
PIN AMALGAM EQUIPMENT
APPLICATOR SET
PIN RETENTION
BENDER THREAD-FORMING PIN 2 inch
MATRIX CONTOURING INSTRUMENT
THREAD-FORMING PIN
ENLARGED
PIN HOLE DRILL

Foldout 3. Dental Instruments

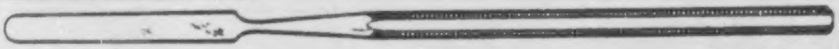

GROVED PIN
GROVED PIN DRIVER
ACTUAL SIZE
PLASTIC FILLING PLUGGERS
GREG #1
GREG #2
GREG #3
#1-2
#5-7
LADMORE #3
WOODSON #1
WOODSON #2
WOODSON #3
ACTUAL SIZE

Foldout 3. Dental Instruments

SPATULAS



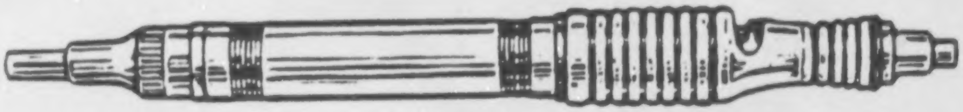
#313



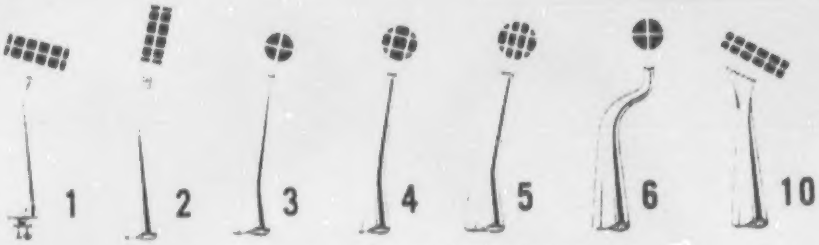
#324

PLASTIC #142

GOLD FOIL CONDENSER SET

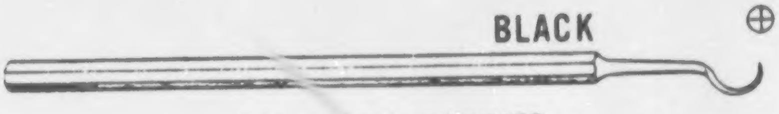


PLUGGING MALLET



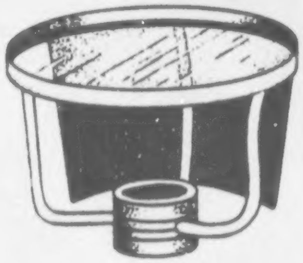
GOLD FOIL PLUGGER POINTS

BLACK



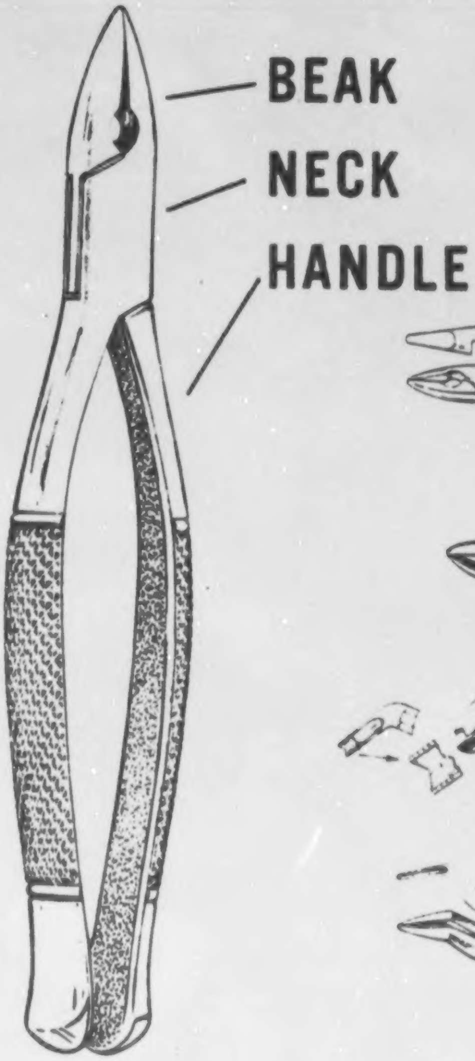
GOLD FOIL CARRIER

ANNEALING TRAY



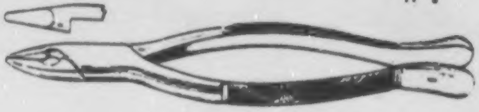
Foldout 3. Dental Instruments.

EXTRACTION FORCEPS

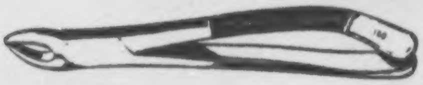

BEAK
NECK
HANDLE

6½ to 7¼ inches
ACTUAL SIZE

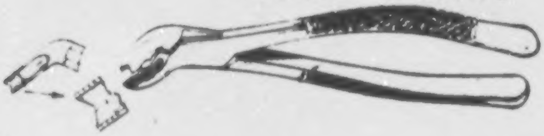
#1



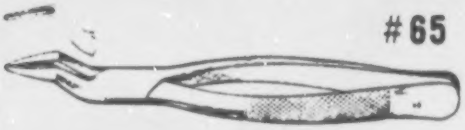
#150 #150S



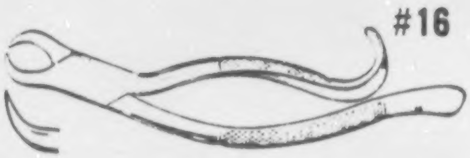
#150AS #151AS



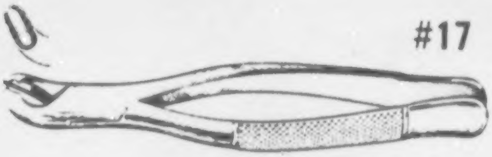
#65



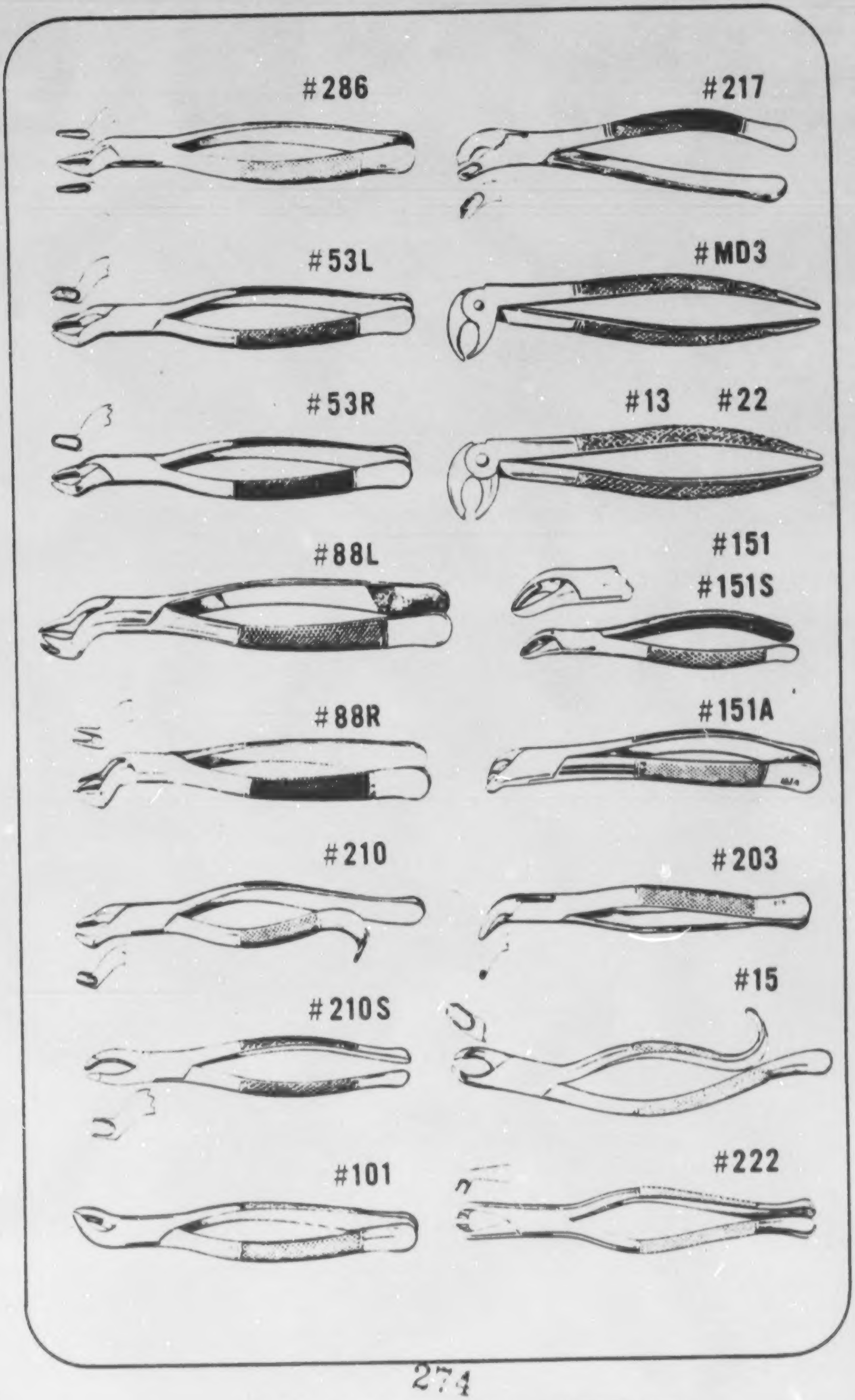
#16



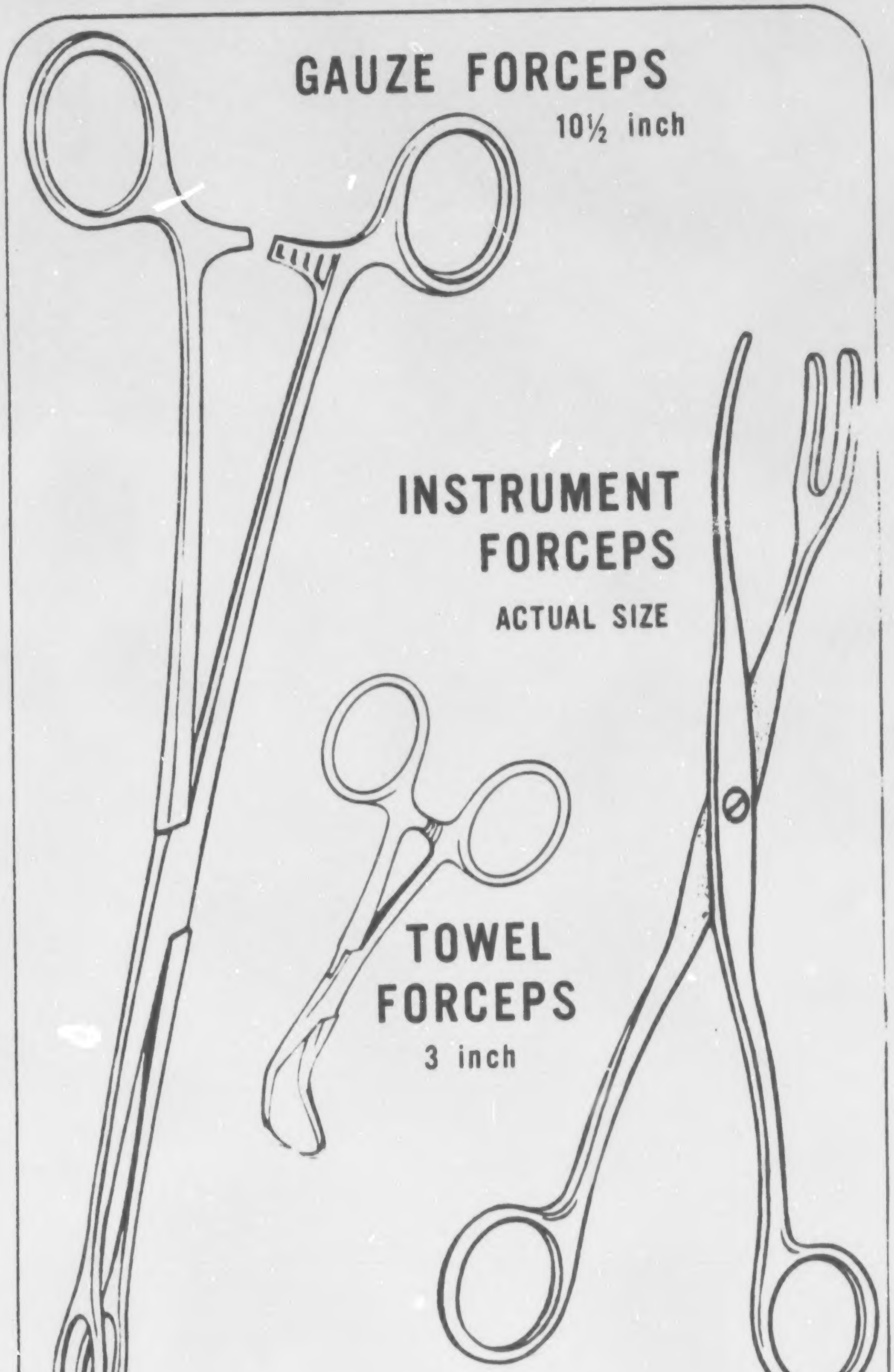
#17



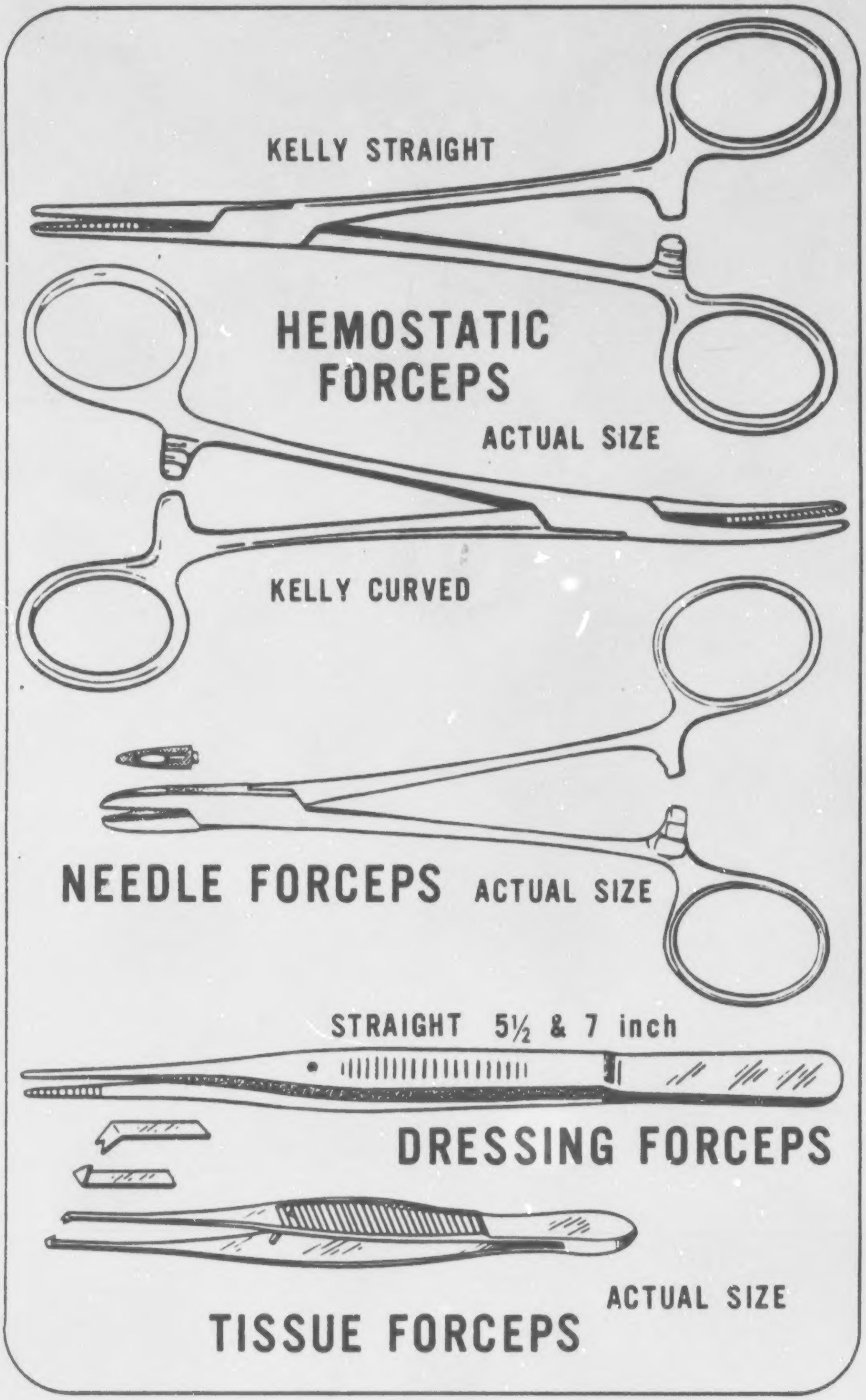
Foldout 34. Dental Instruments


#286
#217
#53L
#MD3
#53R
#13 #22
#88L
#151
#151S
#88R
#151A
#210
#203
#15
#210S
#101
#222

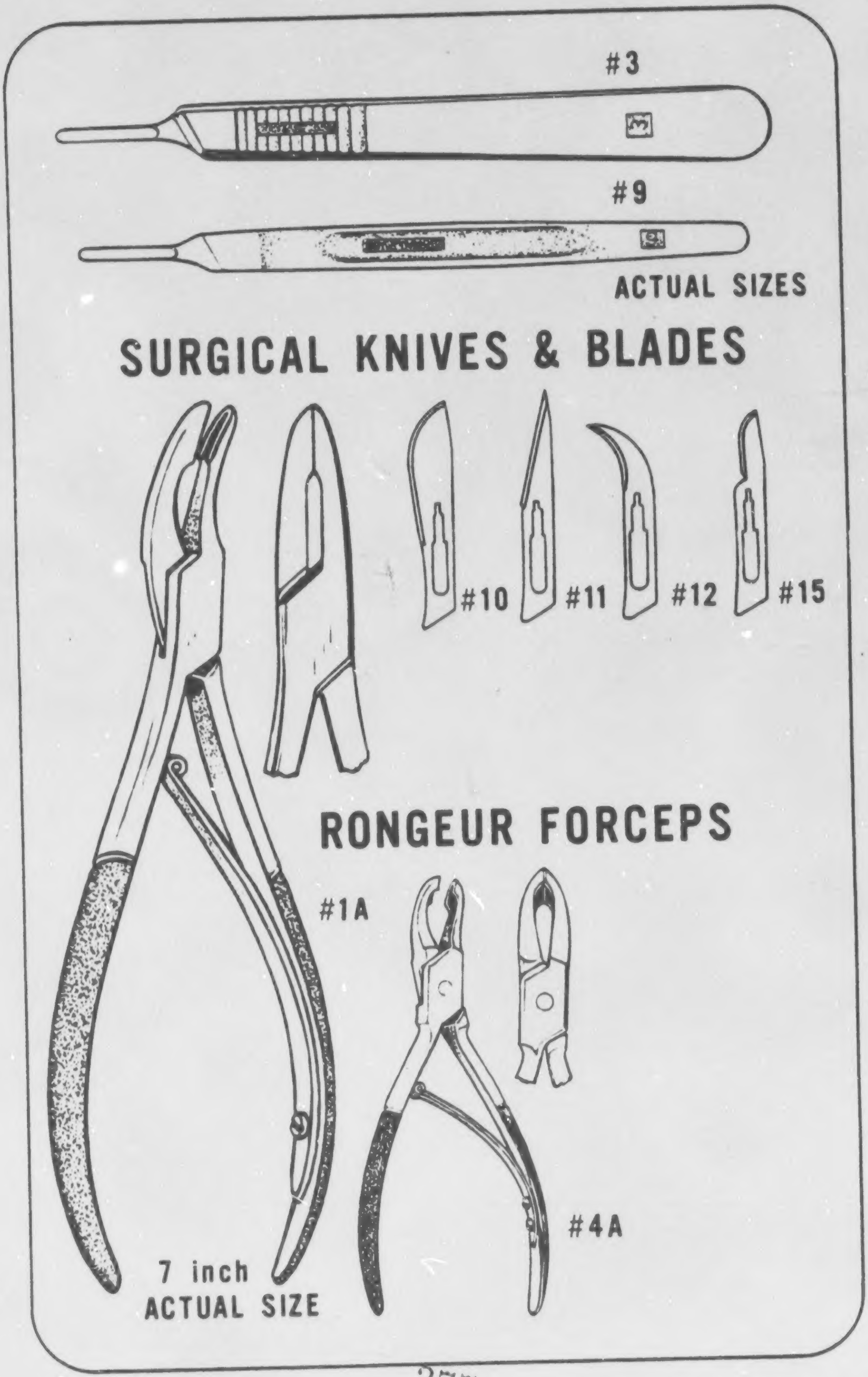
Foldout 4. Dental Instruments


GAUZE FORCEPS
10½ inch
INSTRUMENT FORCEPS
ACTUAL SIZE
TOWEL FORCEPS
3 inch

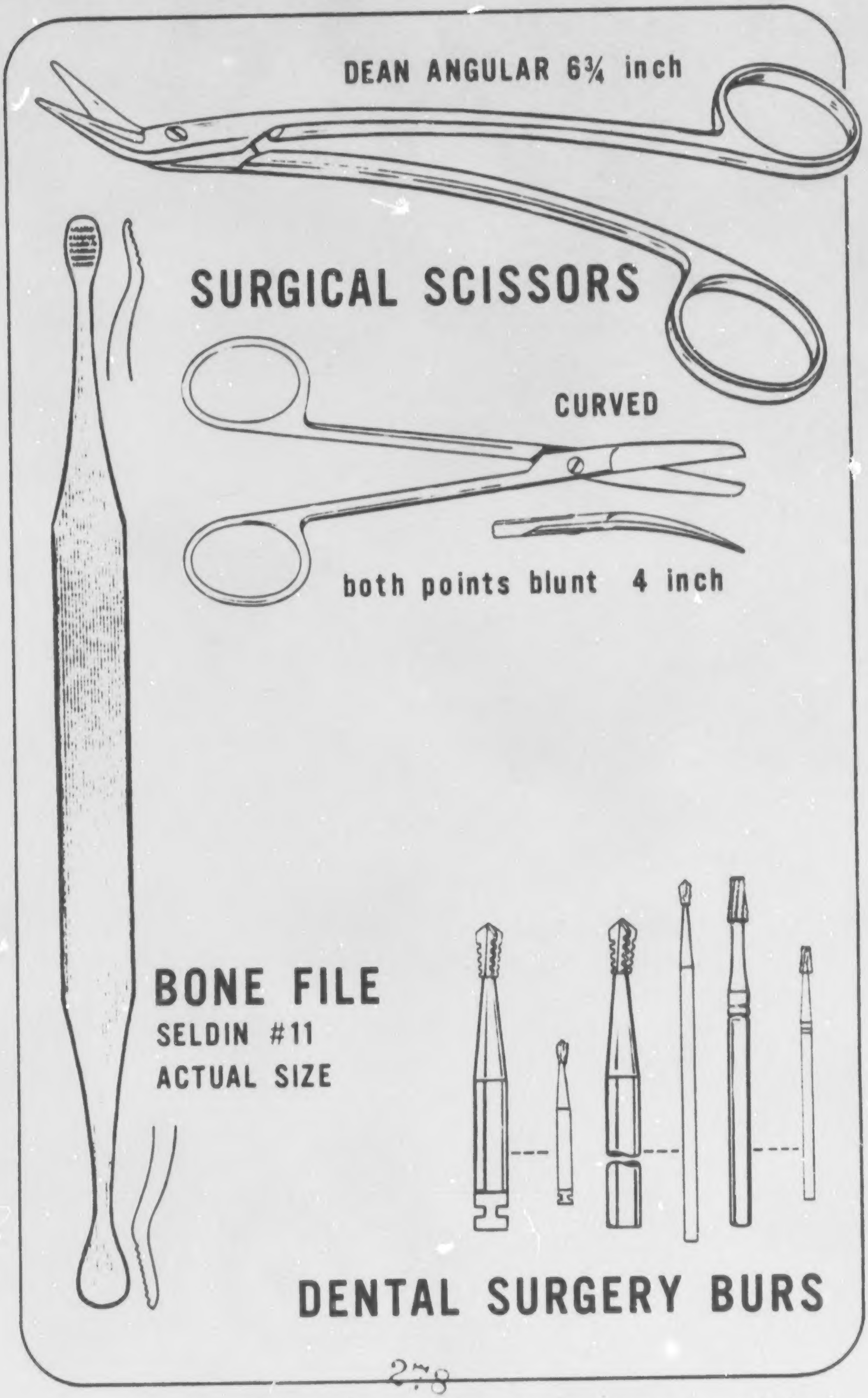
Foldout 4. Dental Instruments.


KELLY STRAIGHT
HEMOSTATIC FORCEPS
ACTUAL SIZE
KELLY CURVED
NEEDLE FORCEPS ACTUAL SIZE
STRAIGHT 5½ & 7 inch
DRESSING FORCEPS
ACTUAL SIZE
TISSUE FORCEPS

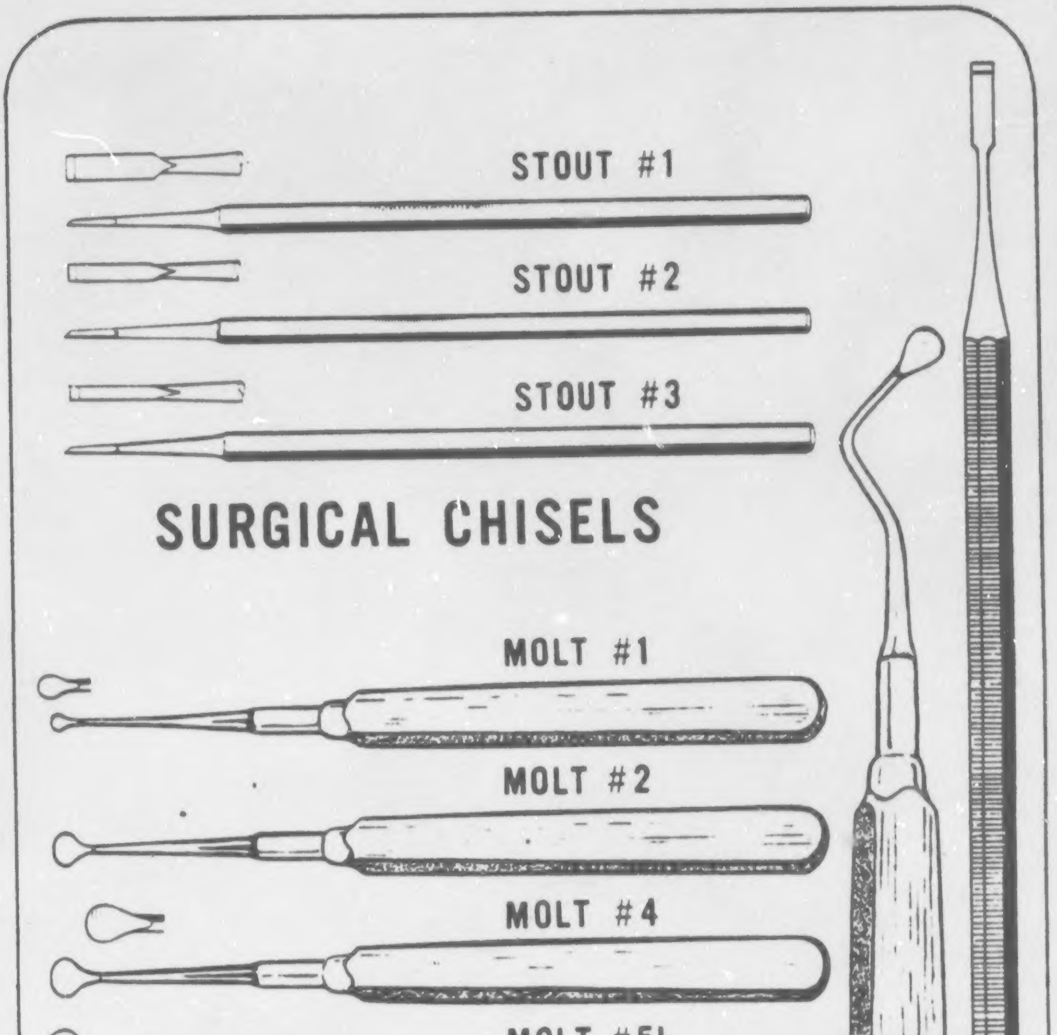
Foldout 4. Dental Instruments (cont'd)


#3
#9
ACTUAL SIZES
SURGICAL KNIVES & BLADES
#10
#11
#12
#15
RONGEUR FORCEPS
#1A
#4A
7 inch
ACTUAL SIZE

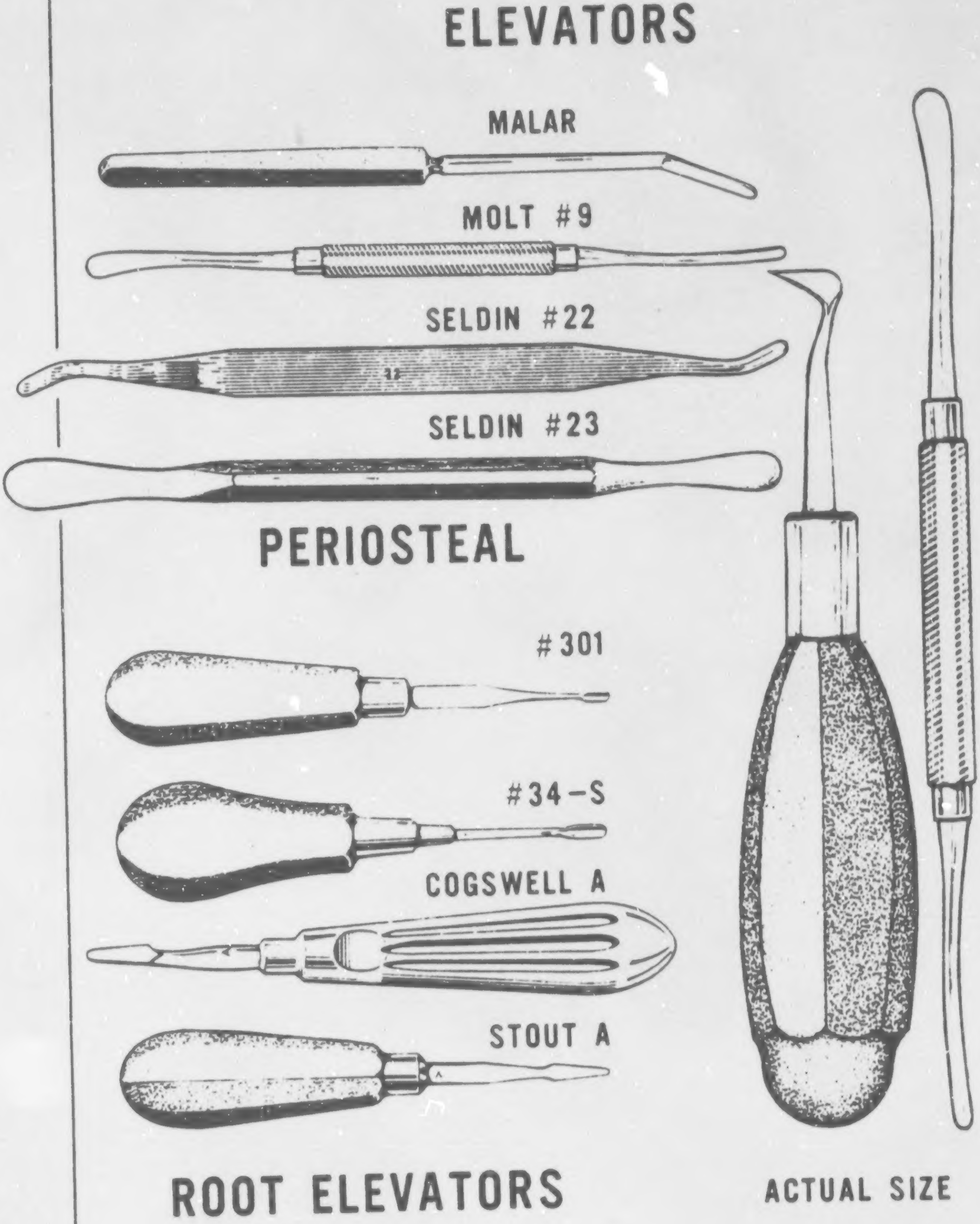
Foldout 4. Dental Instruments (cont'd)


DEAN ANGULAR 6¾ inch
SURGICAL SCISSORS
CURVED
both points blunt 4 inch
BONE FILE
SELDIN #11
ACTUAL SIZE
DENTAL SURGERY BURS

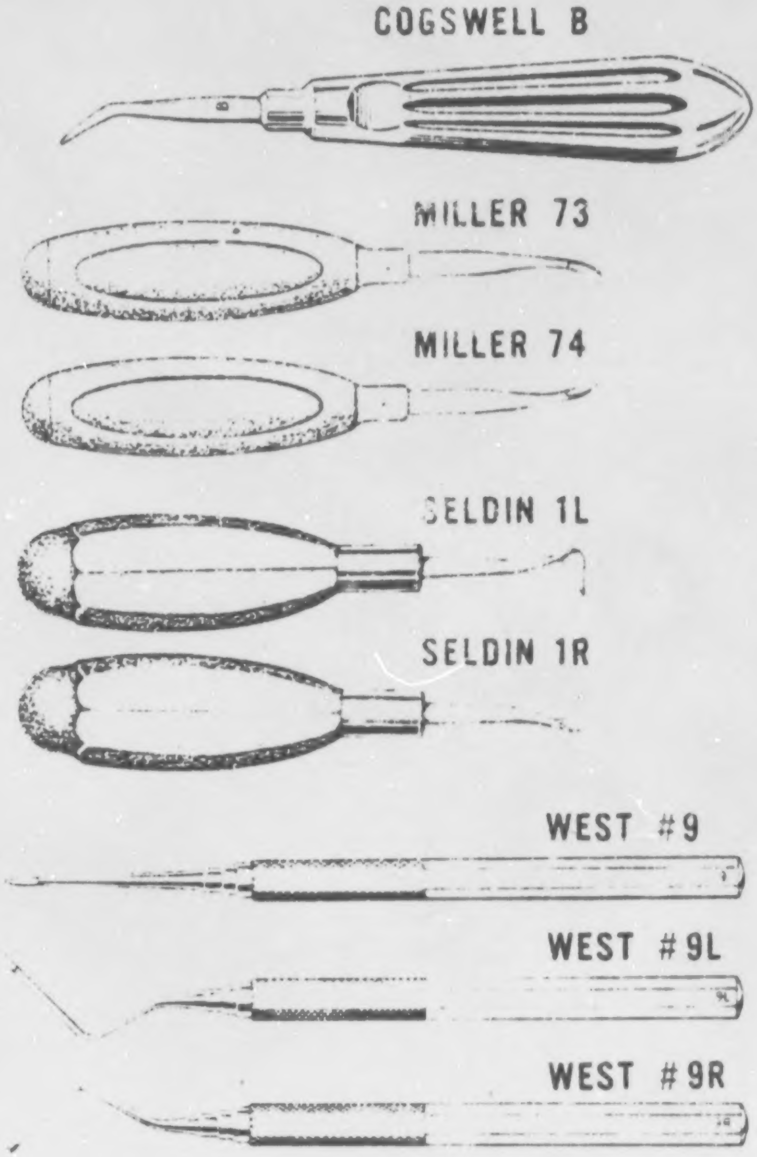
Foldout 4. Dental Instruments (cont'd)


STOUT #1
STOUT #2
STOUT #3
SURGICAL CHISELS
MOLT #1
MOLT #2
MOLT #4
MOLT #5L
MOLT #6R
MOLT #9L
MOLT #10R
CURETTES
ACTUAL SIZE

Foldout 4. Dental Instruments (cont'd).


ELEVATORS
MALAR
MOLT #9
SELDIN #22
SELDIN #23
PERIOSTEAL
#301
#34-S
COGSWELL A
STOUT A
ROOT ELEVATORS
ACTUAL SIZE

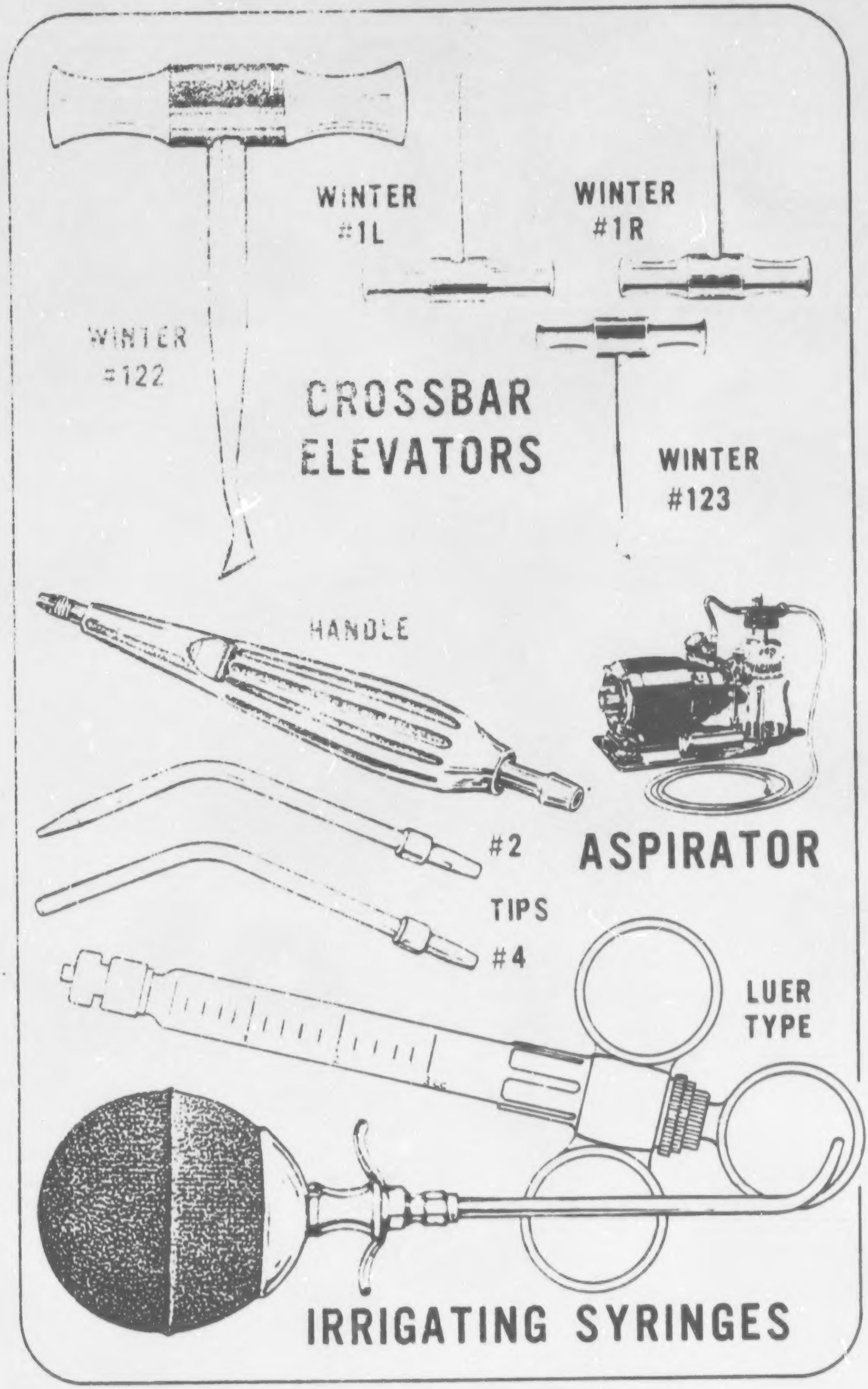
Foldout 5. Dental Instruments



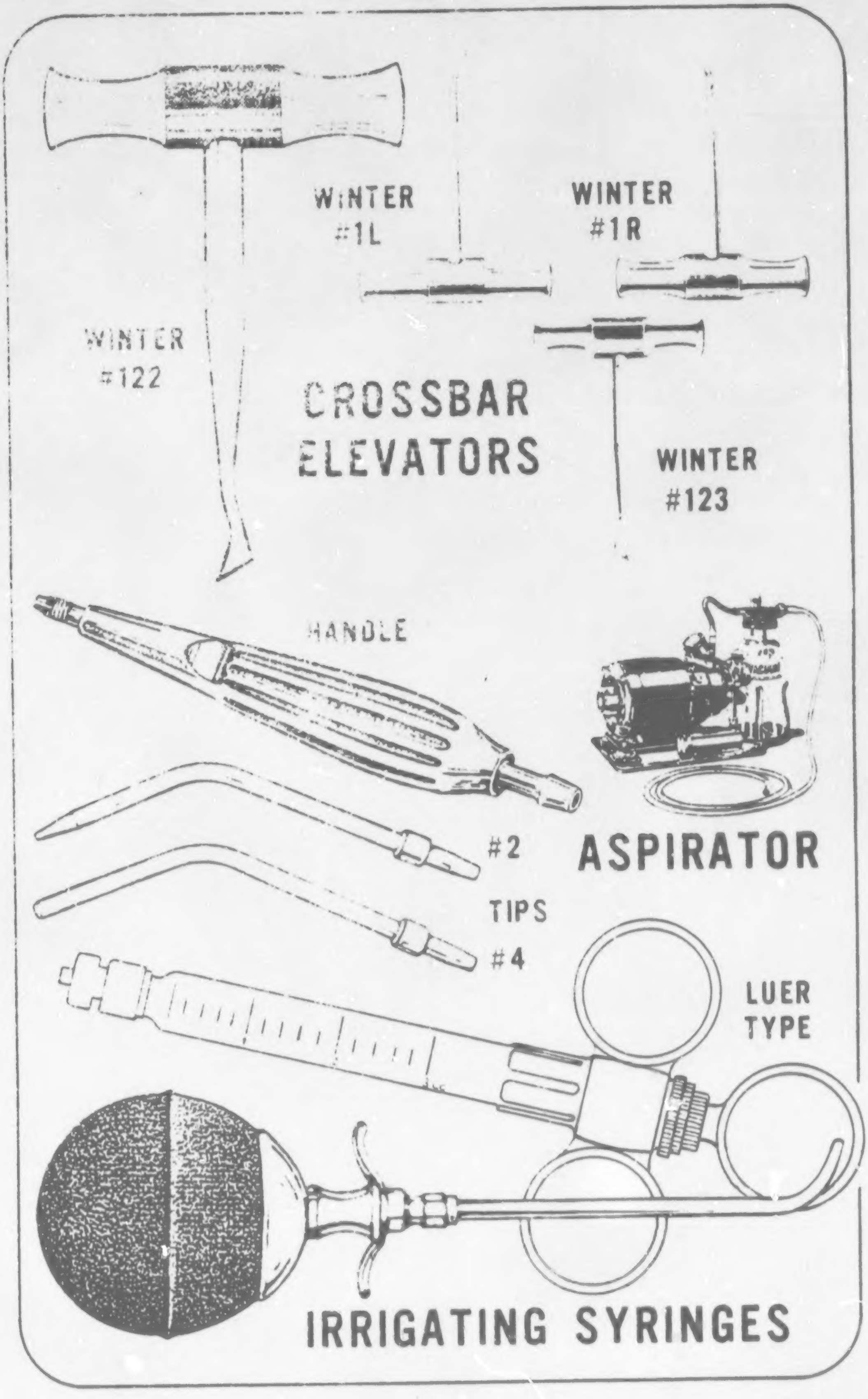
COGSWELL B
MILLER 73
MILLER 74
SELDIN 1L
SELDIN 1R
WEST #9
WEST #9L
WEST #9R

ELEVATORS

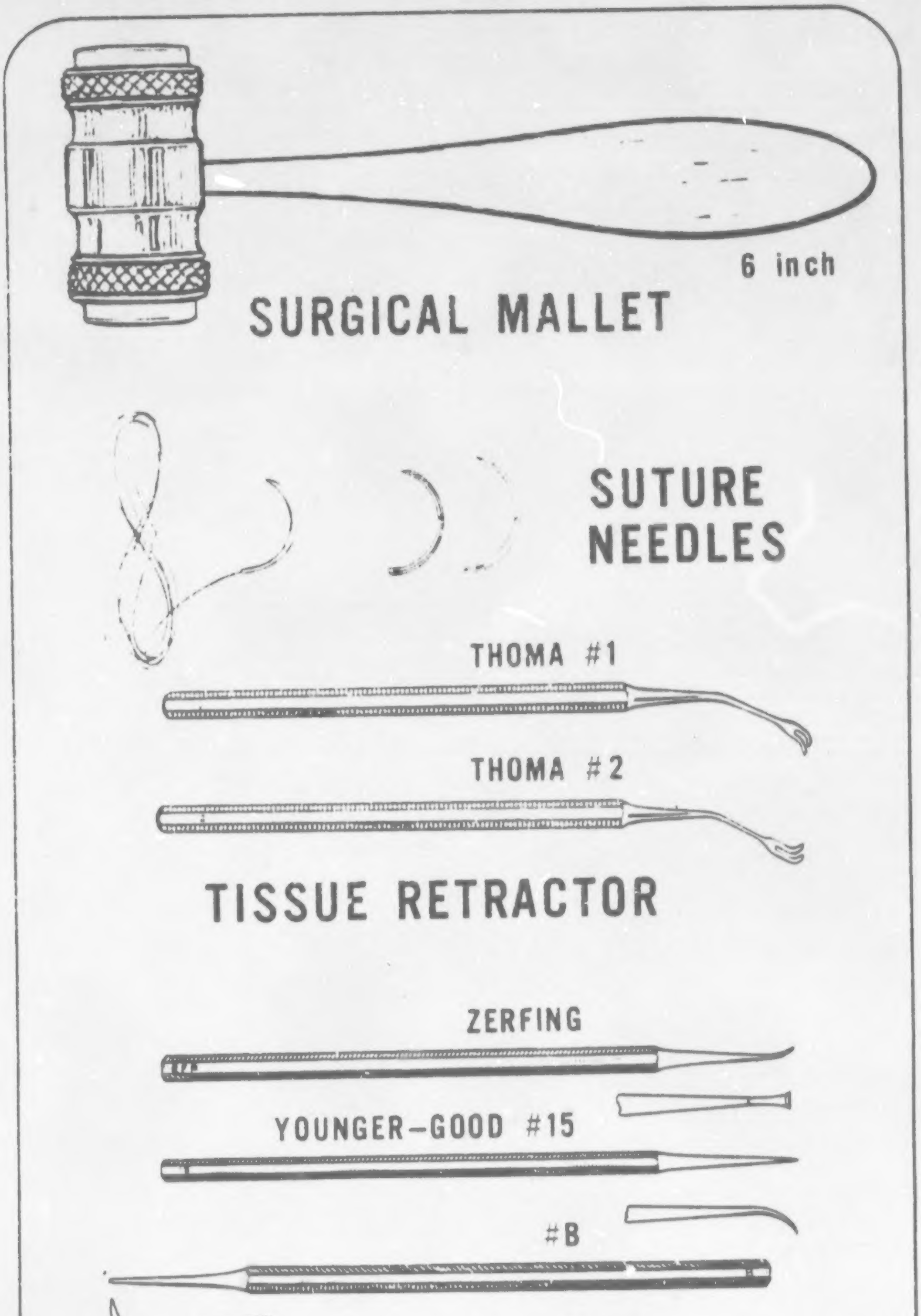
Foldout 5. Dental Instruments


WINTER #1L
WINTER #1R
WINTER #122
CROSSBAR ELEVATORS
WINTER #123
HANDLE
ASPIRATOR
#2
TIPS
#4
LUER TYPE
IRRIGATING SYRINGES

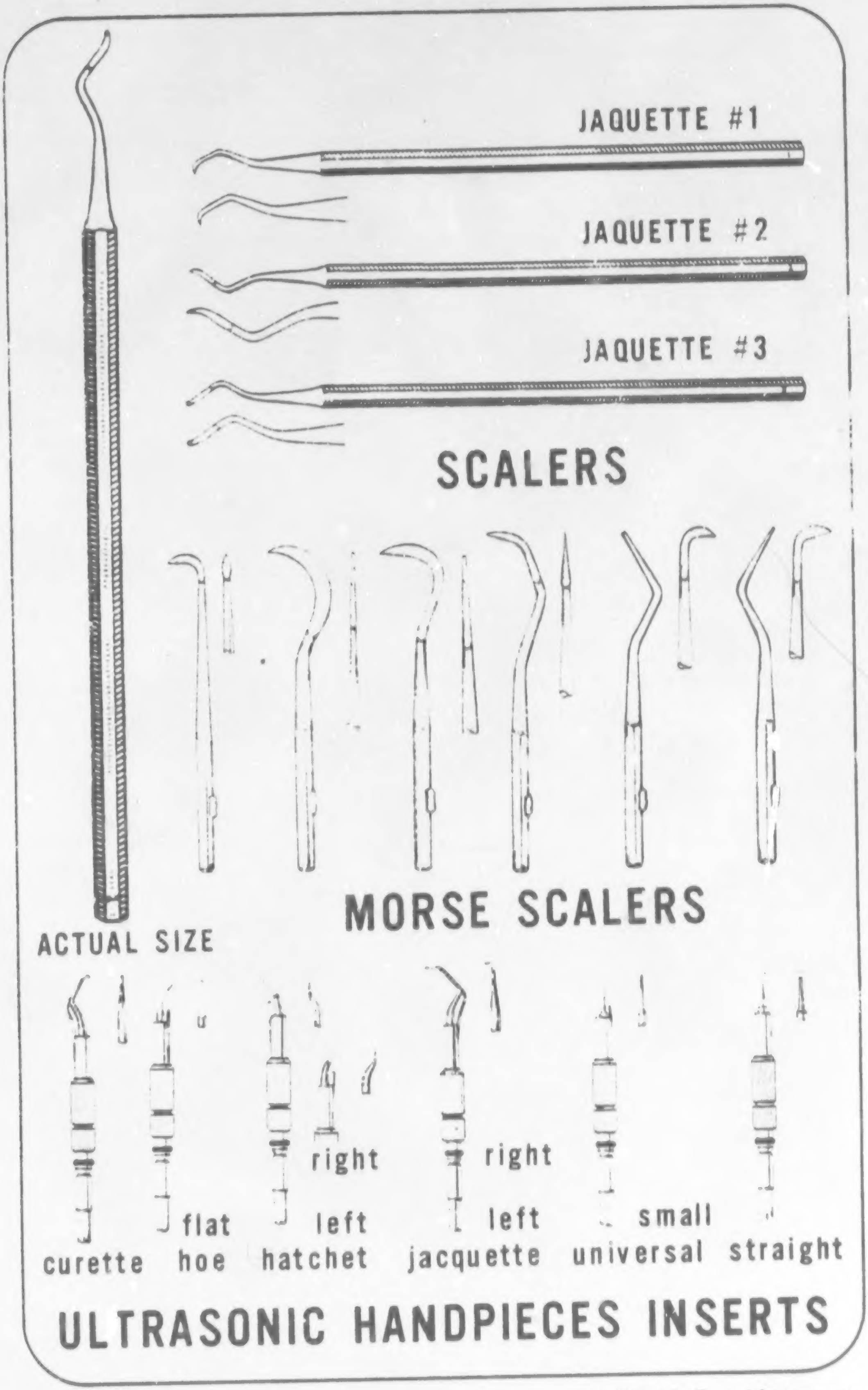
Foldout 5. Dental Instruments


WINTER #1L
WINTER #1R
WINTER #122
CROSSBAR ELEVATORS
WINTER #123
HANDLE
ASPIRATOR
#2
TIPS
#4
LUER TYPE
IRRIGATING SYRINGES

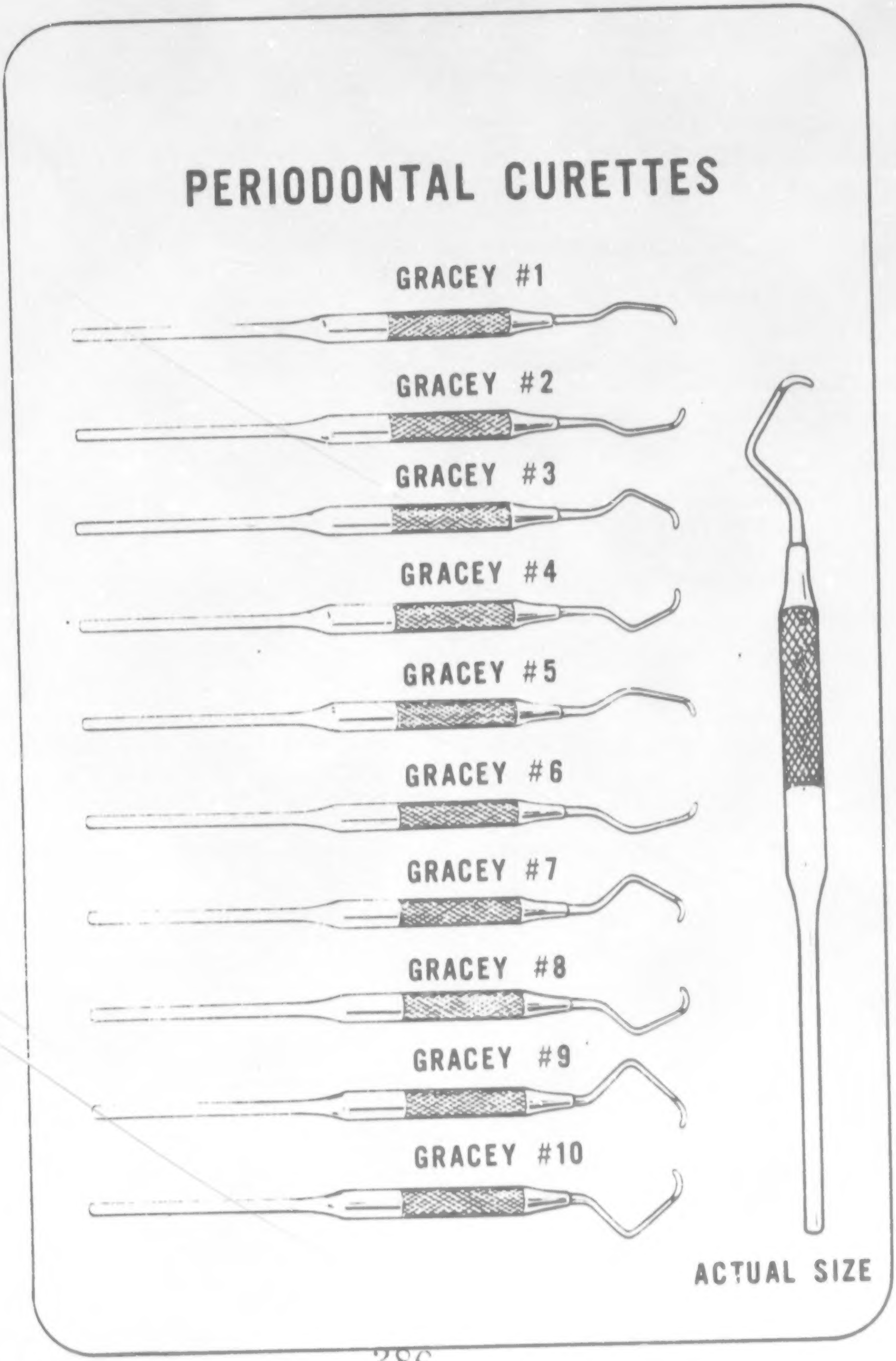
Foldout 5. Dental Instruments


6 inch
SURGICAL MALLET
SUTURE NEEDLES
THOMA #1
THOMA #2
TISSUE RETRACTOR
ZERFING
YOUNGER-GOOD #15
#B
SCALERS

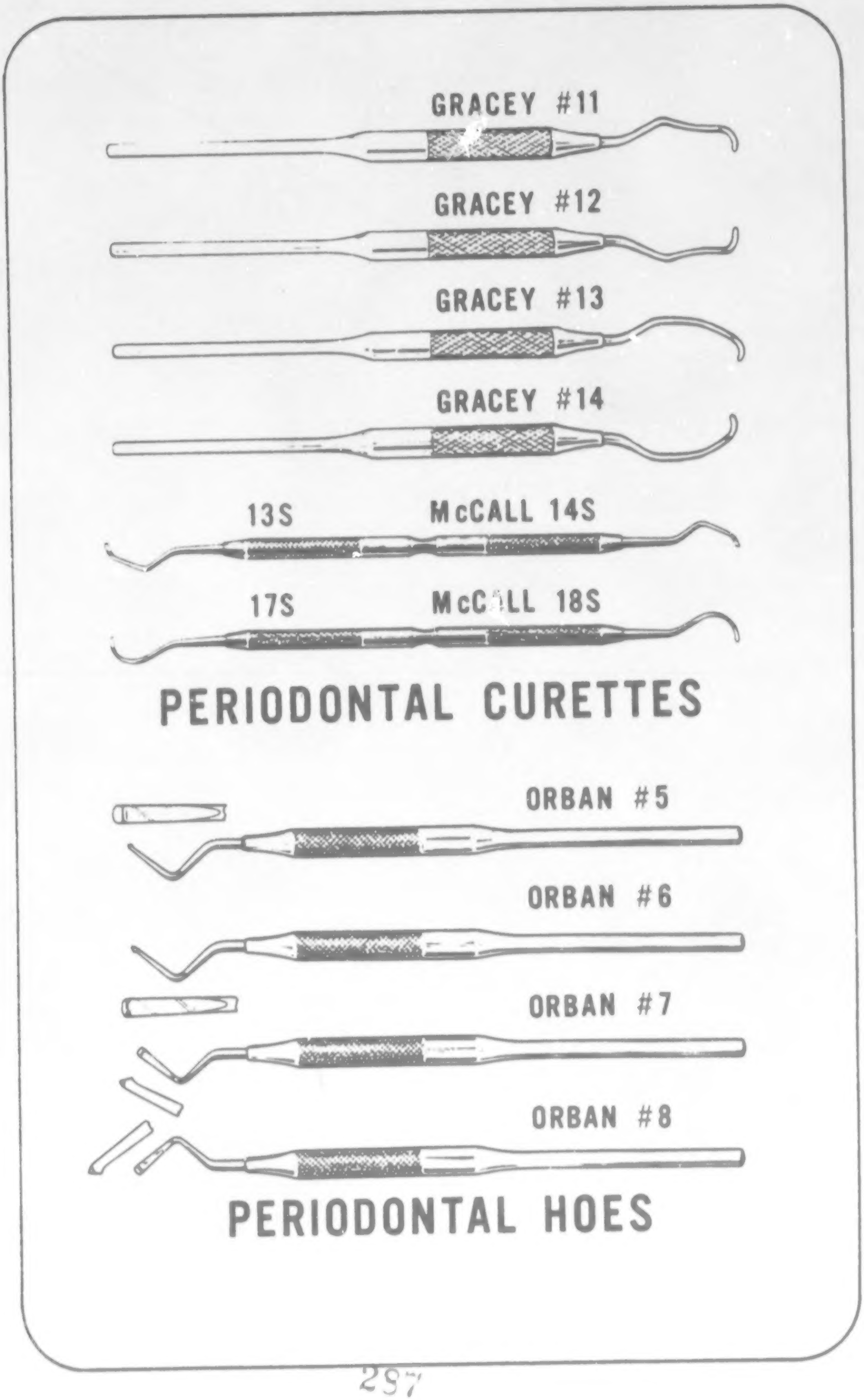
Foldout 5. Dental Instruments


JAQUETTE #1
JAQUETTE #2
JAQUETTE #3
SCALERS
MORSE SCALERS
ACTUAL SIZE
curette
flat
hoe
right
left
hatchet
right
left
jacquette
small
universal
straight
ULTRASONIC HANDPIECES INSERTS

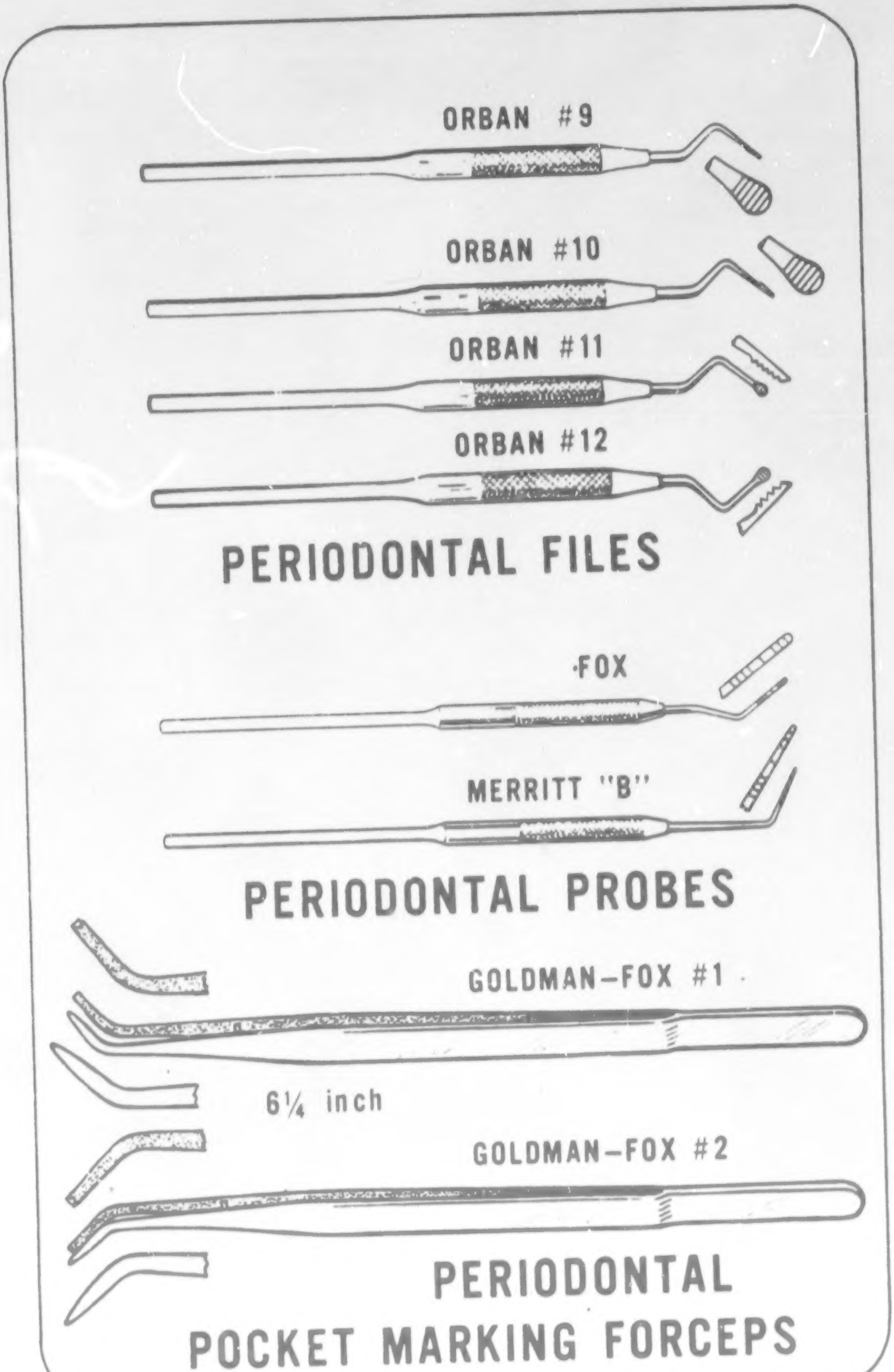
Foldout 5. Dental Instruments.


PERIODONTAL CURETTES
GRACEY #1
GRACEY #2
GRACEY #3
GRACEY #4
GRACEY #5
GRACEY #6
GRACEY #7
GRACEY #8
GRACEY #9
GRACEY #10
ACTUAL SIZE

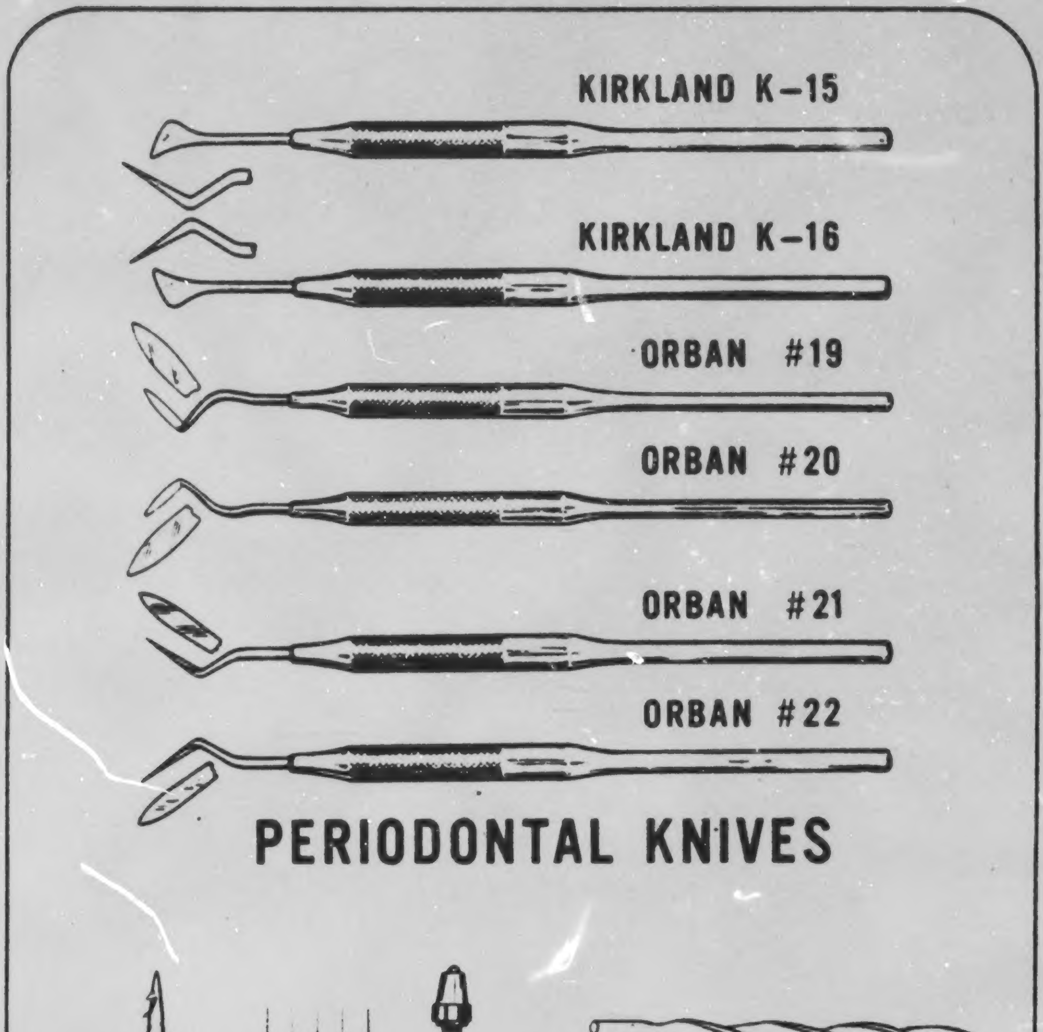
Foldout 6. Dental Instruments


GRACEY #11
GRACEY #12
GRACEY #13
GRACEY #14
13S
McCALL 14S
17S
McCALL 18S
PERIODONTAL CURETTES
ORBAN #5
ORBAN #6
ORBAN #7
ORBAN #8
PERIODONTAL HOES

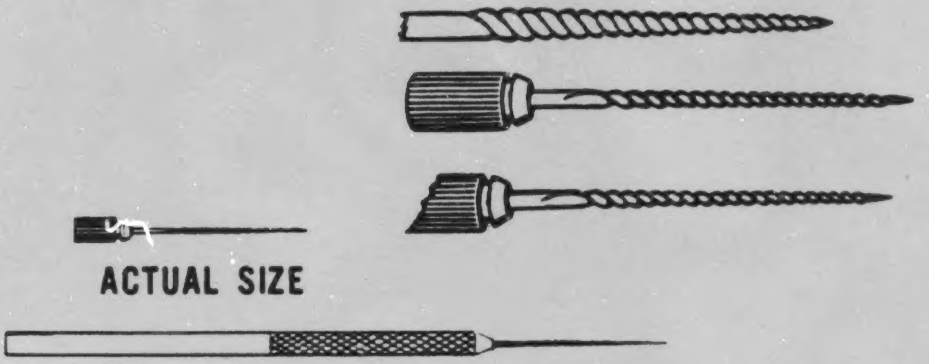
Foldout 6. Dental Instruments


ORBAN #9
ORBAN #10
ORBAN #11
ORBAN #12
PERIODONTAL FILES
FOX
MERRITT "B"
PERIODONTAL PROBES
GOLDMAN-FOX #1
6¼ inch
GOLDMAN-FOX #2
PERIODONTAL POCKET MARKING FORCEPS

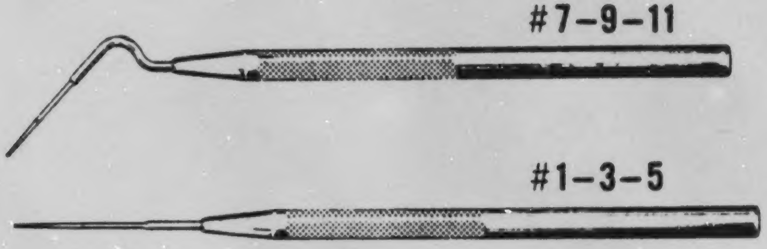
Foldout 6. Dental Instruments


KIRKLAND K-15
KIRKLAND K-16
ORBAN #19
ORBAN #20
ORBAN #21
ORBAN #22
PERIODONTAL KNIVES
ACTUAL SIZE
REAMERS
ROOT CANAL
BROACHES & BROACH HOLDER

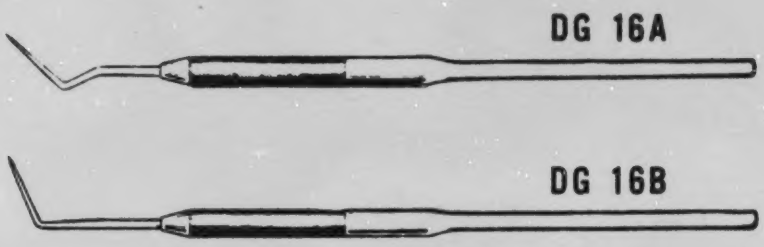
Foldout 6. Dental Instruments


ACTUAL SIZE

ROOT CANAL FILES

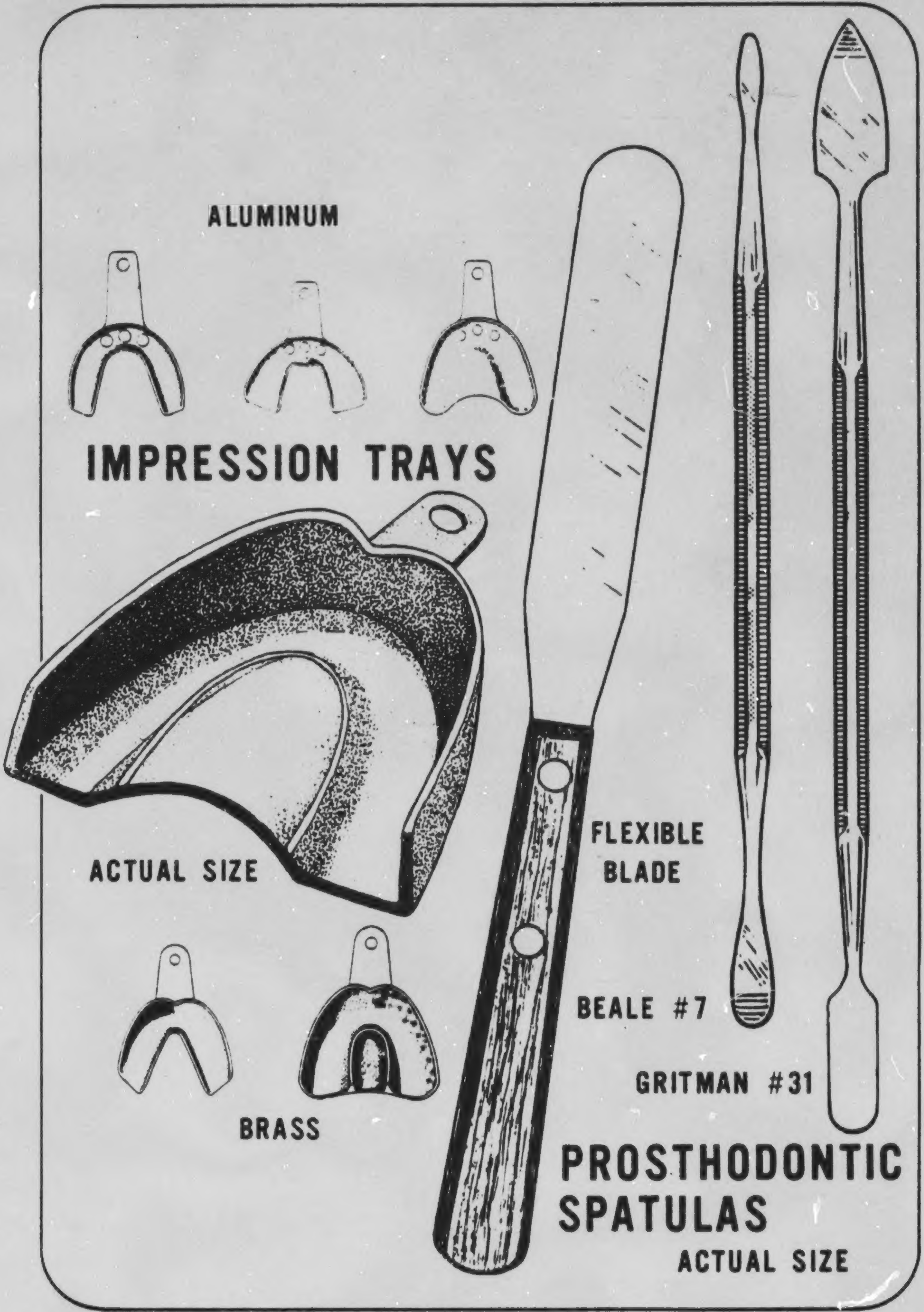


ROOT CANAL PLUGGERS

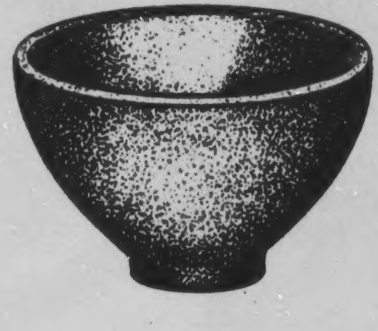

DG 16A
DG 16B

ENDODONTIC EXPLORERS

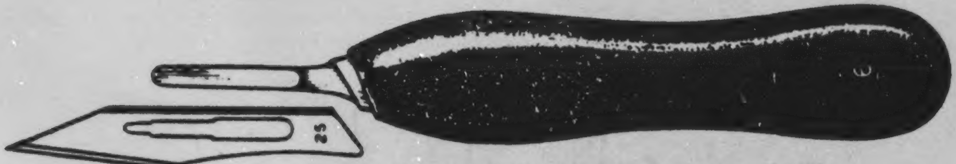
Foldout 6. Dental Instruments.


ALUMINUM
IMPRESSION TRAYS
ACTUAL SIZE
BRASS
FLEXIBLE BLADE
BEALE #7
GRITMAN #31
PROSTHODONTIC SPATULAS
ACTUAL SIZE

Foldout 7. Dental Instruments

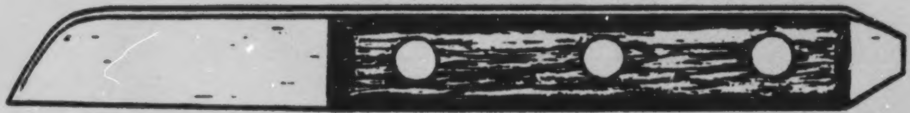


MIXING BOWL

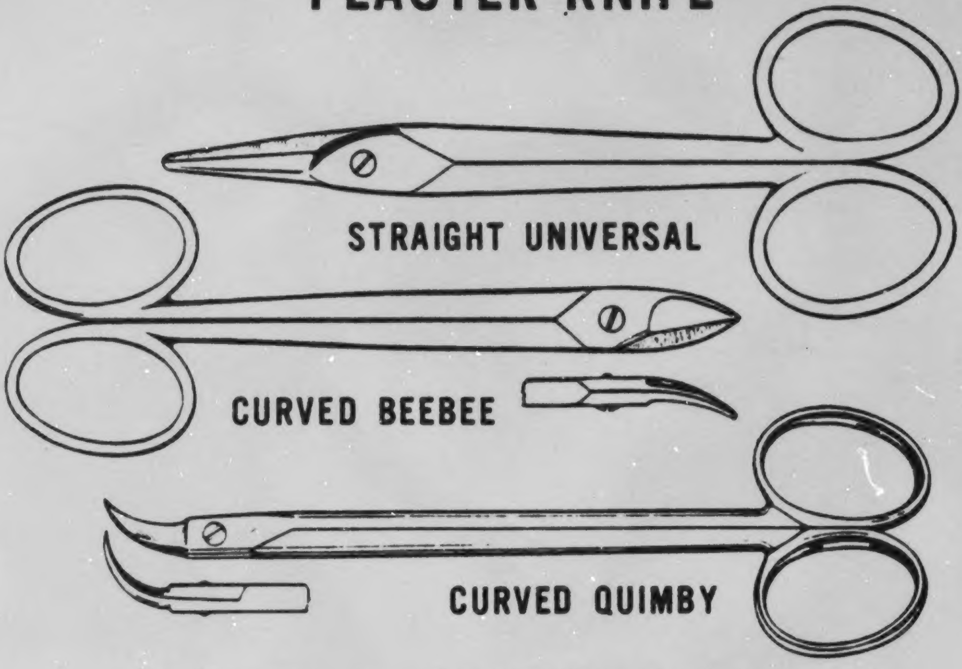


#25 BLADE

COMPOUND KNIFE



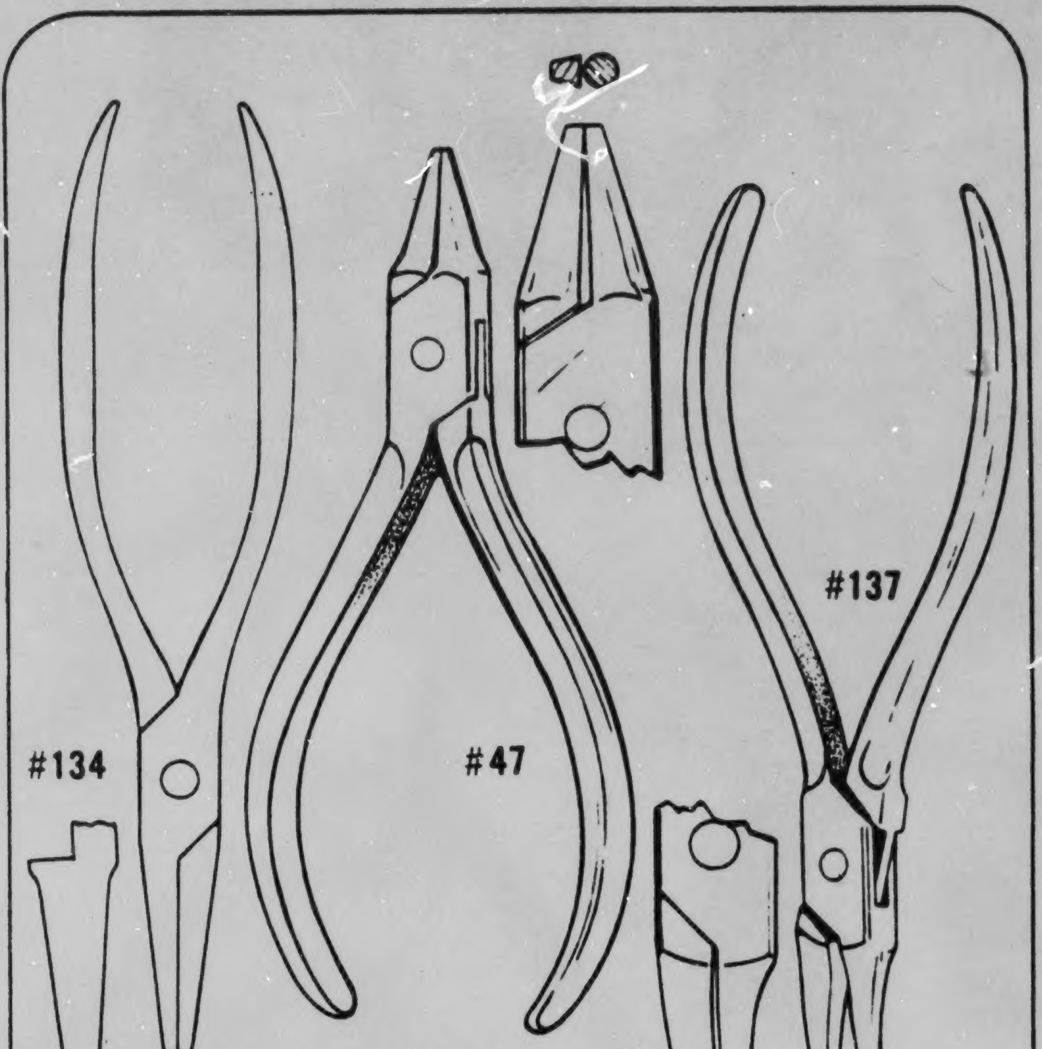
PLASTER KNIFE


STRAIGHT UNIVERSAL
CURVED BEEBEE
CURVED QUIMBY

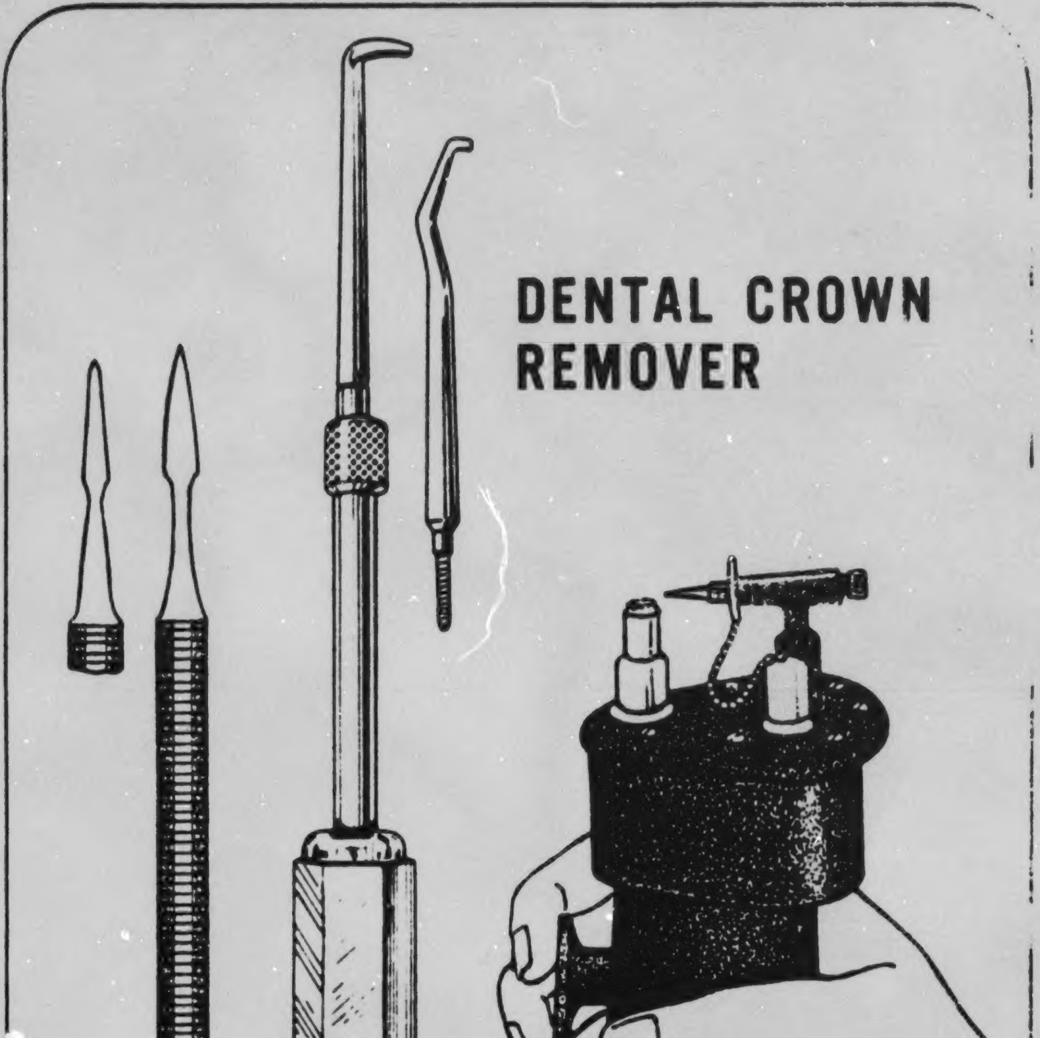
COLLAR & CROWN SCISSORS

ACTUAL SIZES

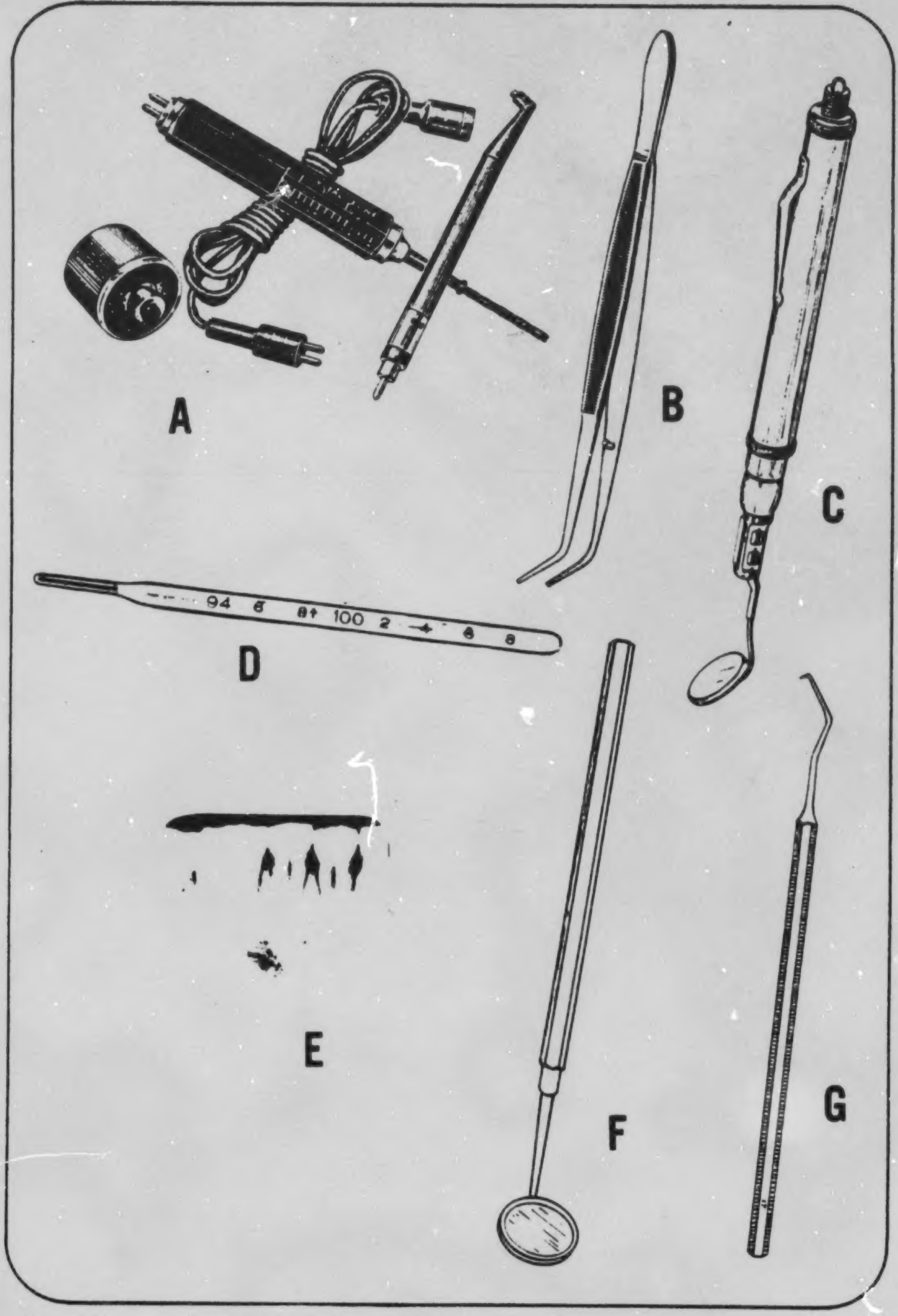
Foldout 7. Dental Instruments


#134
#47
#137
#122
#200
DENTAL
PLIERS
ACTUAL SIZE
4¾ to 5½ inches

Foldout 7. Dental Instruments

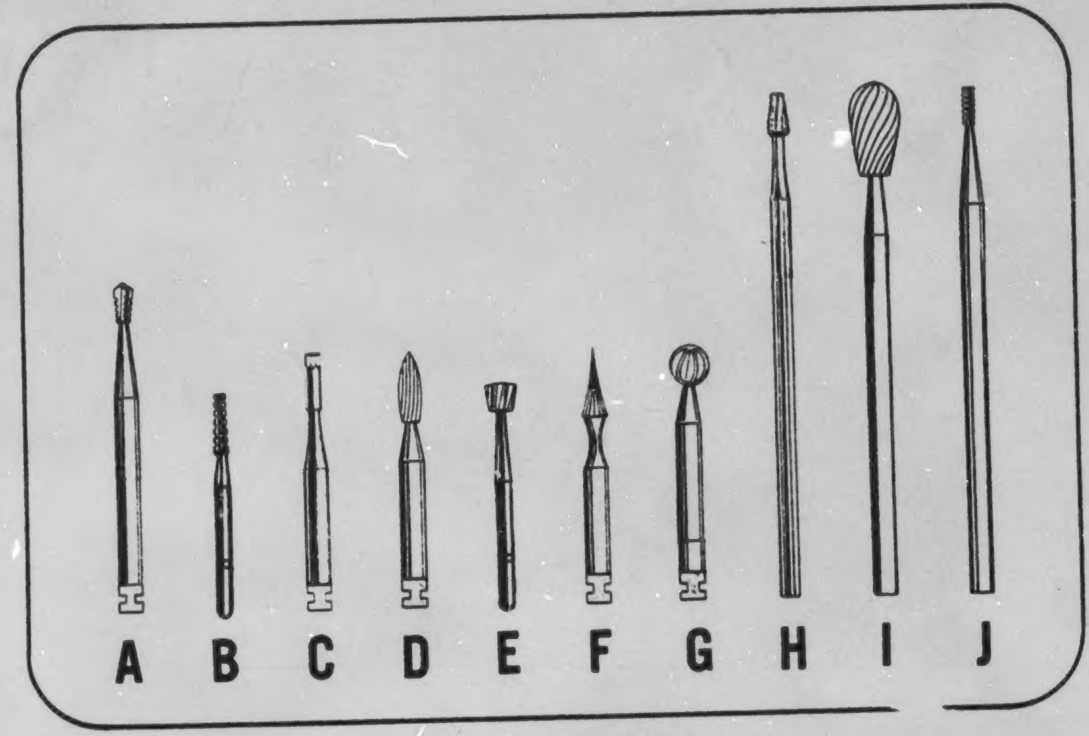

DENTAL CROWN REMOVER
ALCOHOL BLOWTORCH
ROACH CARVER

Foldout 7. Dental Instruments.

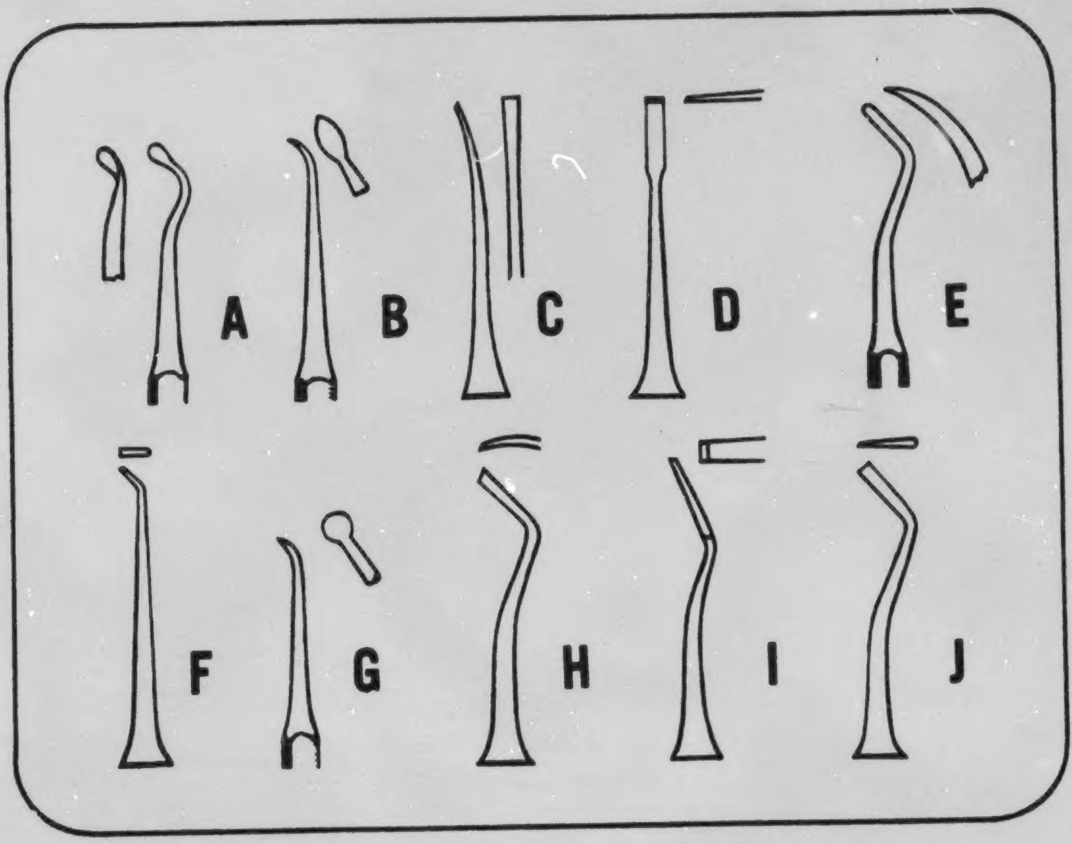

A
B
C
94 6 8 100 2 6 8
D
E
F
G

Exercise 401. Diagnostic instruments.

Foldout 8. Dental Instrument Exercises

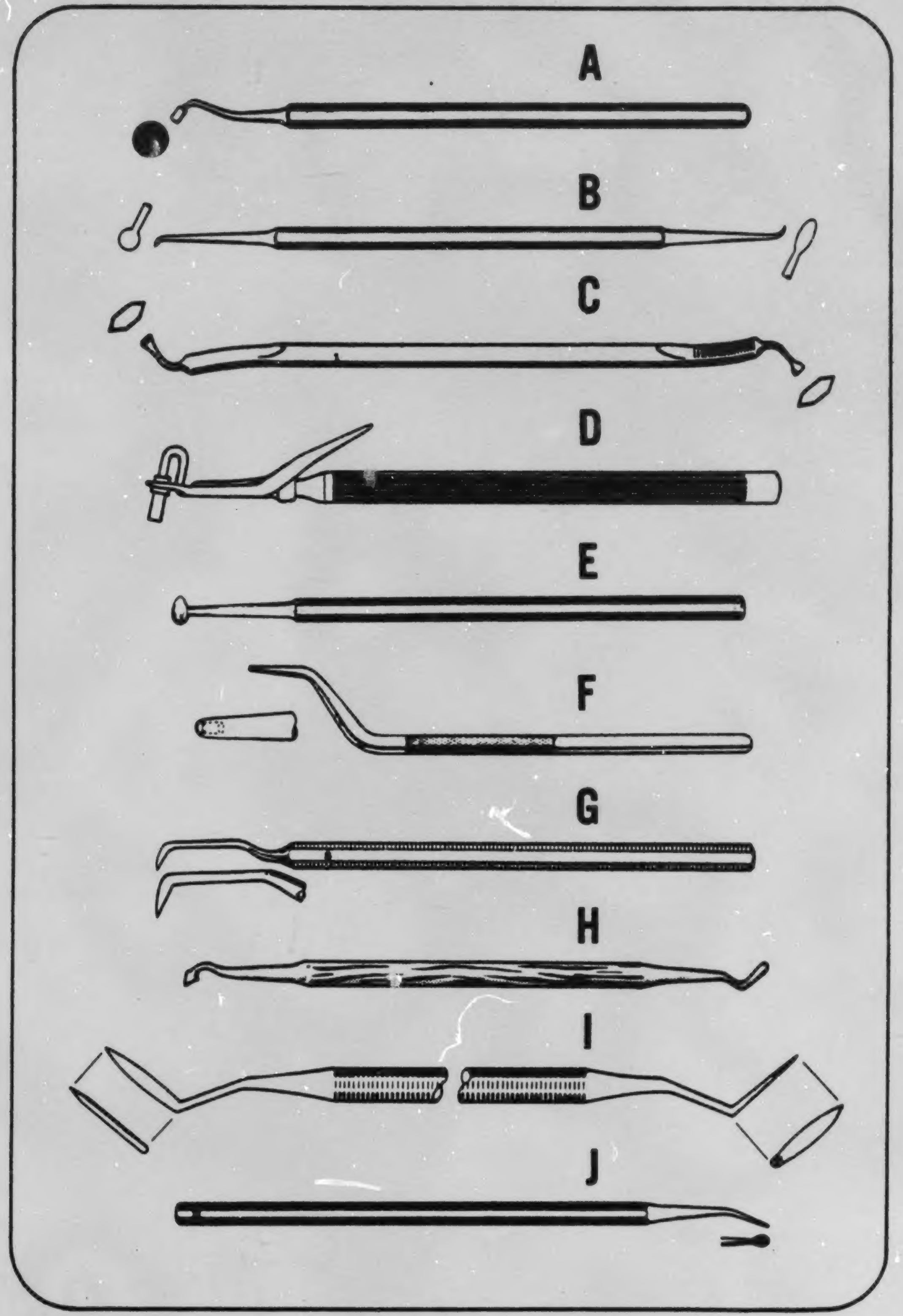

A
B
C
D
E
F
G
H
I
J

Exercise 402. Dental burs.


A
B
C
D
E
F
G
H
I
J

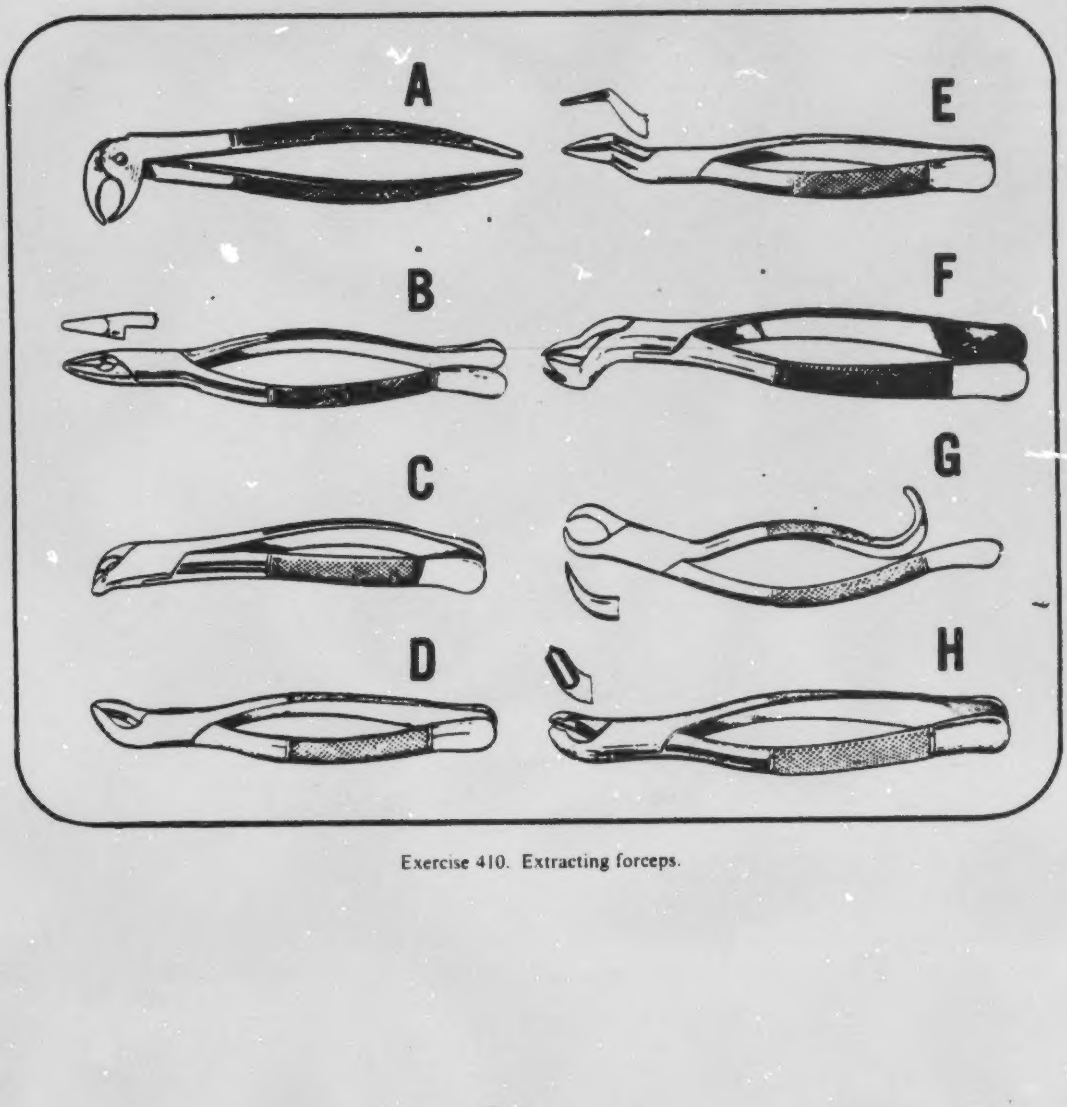
Exercise 405. Restorative cutting instruments.

Foldout 8. Dental Instrument Exercises

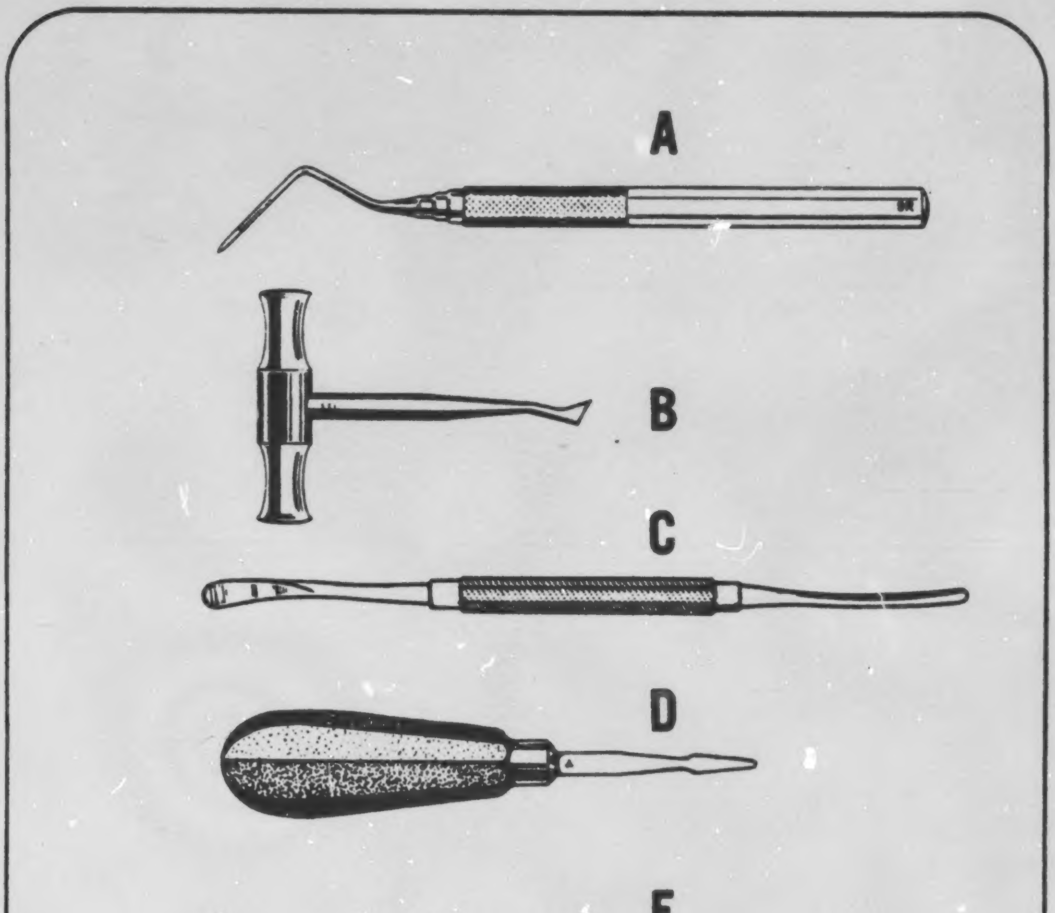

A
B
C
D
E
F
G
H
I
J

Exercise 407. Amalgan instruments.

Foldout 8. Dental Instrument Exercises.

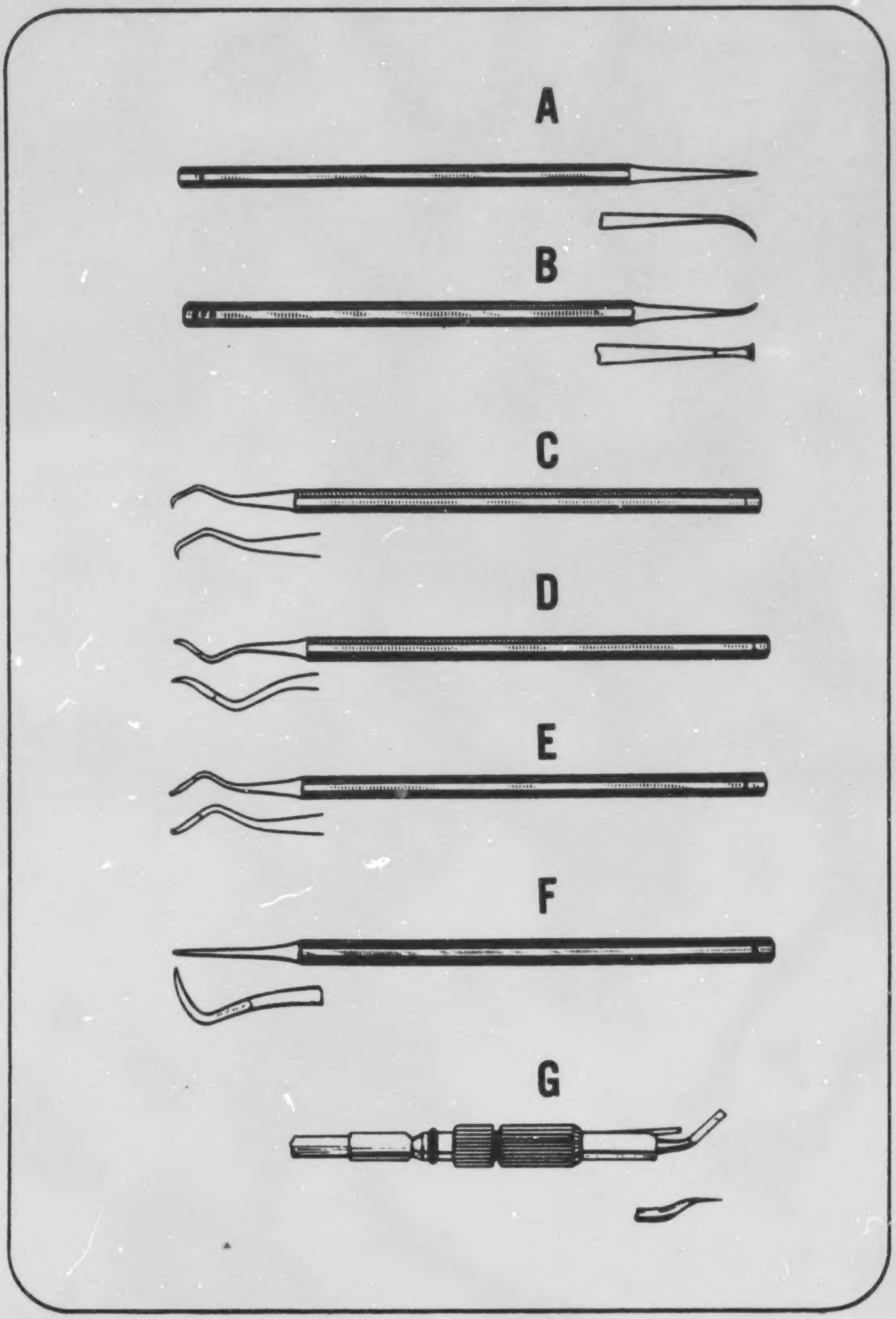


Exercise 410. Extracting forceps.

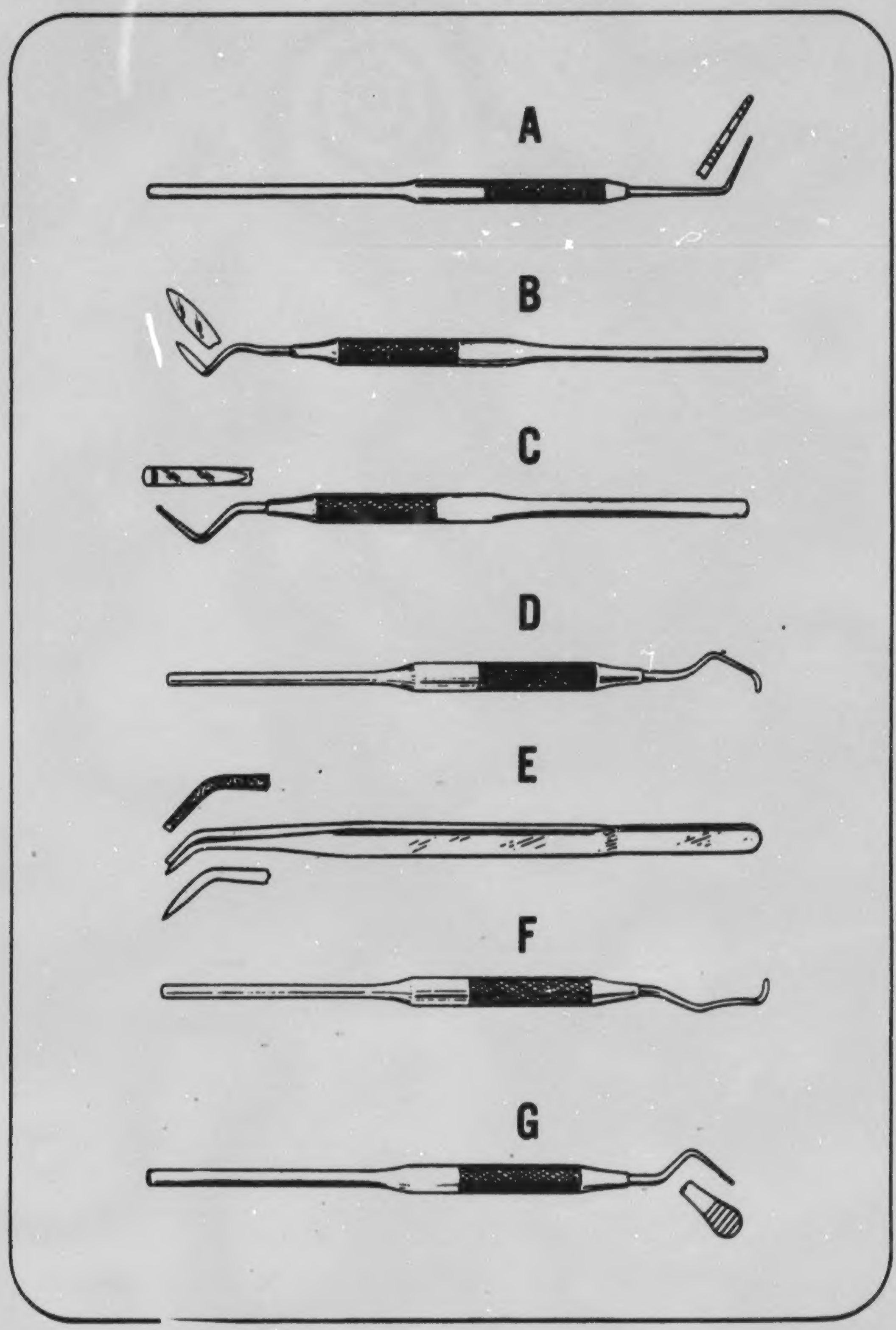


Exercise 413. Elevators.

Foldout 8. Dental Instrument Exercises (cont'd)



Exercise 415. Scaling instruments.



Exercise 416. Periodontal instruments.

Foldout 8. Dental Instrument Exercises (cont'd).

98150 04 7501

CDC 98150

DENTAL SPECIALIST

(AFSC 98150)

Volume 4

Clinical Procedures

Proficimus More Irretenti

Extension Course Institute
Air University

Preface

YOU ARE NOW starting your studies of the fourth and final volume of the 98150 Career Development Course. This volume, like the preceding volumes, is designed to present the information you need to perform your job and to prepare you for your promotion (SKT) testing.

Chapter 1 concerns the USAF Preventive Dentistry Program. The scope of the program along with prophylaxis technique, preventive dentistry phase microscopy, and dietary needs are discussed in detail. The second chapter provides information on radiographic principles, safety, film exposure technique, and the processing of radiographic film. Chapter 3 pertains to the basic assisting principles. Discussed in this chapter are the professional standards of your vocation, the fundamental assisting procedures, the concepts and techniques of four-handed dentistry, and the management of emergency situations. The final chapter, Chapter 4, discusses the procedures and assisting techniques associated with the dental specialty sections.

If you have questions on the accuracy or currency of the subject matter of the text, or recommendations for its improvement, send them to USAF School of Health Care Sciences/MSTW, Sheppard AFB TX 76311.

If you have questions on course enrollment or administration, or on any of ECI's instructional aids (Your Key to Career Development, Behavioral Objective Exercises, Volume Review Exercise, and Course Examination), consult your education officer, training officer, or NCO, as appropriate. If he can't answer your questions, send them to ECI, Gunter AFS AL 36118, preferably on ECI Form 17, Student Request for Assistance.

This volume is valued at 48 hours (16 points).

Material in this volume is technically accurate, adequate, and current as of October 1974.

Contents

Page

Preface . . . . *iii*

Chapter

1 USAF Preventive Dentistry Program 1

2 Dental Radiology 31

3 General Assisting Procedures 72

4 The Specialty Sections 100

Answers for Exercises 121

298

MODIFICATIONS

Pages 1-5 of this publication has (have) been deleted in adapting this material for inclusion in the "Trial Implementation of a Model System to Provide Military Curriculum Materials for Use in Vocational and Technical Education." Deleted material involves extensive use of military forms, procedures, systems, etc. and was not considered appropriate for use in vocational and technical education.

~~10. What oral hygiene items sold by the base exchange should be given promotional emphasis?~~

~~11. When should special emphasis be placed on the Air Force Dependent School Oral Health Programs?~~

~~12. Would incipient caries or mild gingivitis be a disqualifying factor for Air Force foodhandlers?~~

1-4. Oral Hygiene and Diet

Oral hygiene is the total effort a patient expends to keep the hard and soft structures of the mouth in a state of health. Close cooperation among the dental officer, you, and the patient is necessary to maintain effective patient oral hygiene. The teeth must be cleaned properly if correct oral hygiene is to be maintained, and toothbrushing is the most important single factor in this maintenance. As you know, you brush your teeth to clean them of all bacterial plaque that accumulates and to stimulate the soft structures. If the patient does not remove the plaque by brushing, calculus forms. Then, you, or other dental personnel must remove the calculus by scaling the teeth with instruments. Even with a good oral hygiene program the patient's oral condition could be adversely affected if his diet is not adequate. Therefore, we have included dietary information in this section.

603. State the need for home oral care, name the items that are required, and explain how they should be used.

Home Care. Home care is best defined as the total oral hygiene effort the patient accomplishes. This, of course, does not restrict home care to the home. This definition makes inclusive in the term "home care" those oral hygiene efforts the patient makes in his home, on his job, or elsewhere.

One of your most important duties is to instruct the patient in proper home care. If you can make a patient understand the reasons and need for correct mouth cleansing, he will usually cooperate. Explain to the patient that periodontal disease starts with the accumulation of trapped food and plaques from around the teeth—and that the chief purpose of a good oral hygiene program is to remove these accumulations. Warn him of the diseases and explain the possible consequences of these diseases. You will also need to advise him on the use of toothbrushes, methods of brushing, dentifrices, floss and tape, interdental stimulators, and irrigating devices.

Toothbrushes. There are two groups of toothbrushes—manual and mechanical. While the manual toothbrush has been used for years, recently the mechanical toothbrush has proven its effectiveness. Tests show that mechanical brushes, operated by a type of motor, clean and massage oral tissues as effectively as manual brushes if used an equal amount of time. The recommended toothbrush is a small multituft brush with soft or medium bristles. Before you can explain the method to a patient, you must master it yourself.

Manual toothbrushes vary greatly in their angled handles. The heads vary in size, shape, and texture. The shape of the heads may be straight, concave, convex, sloping, or tufted end. The texture of the bristles may be hard, medium, or soft. The sizes of the heads vary greatly. The brush recommended for most patients has a small, flat, bristle head and a straight handle. The dental officer often prescribes a specific type of manual brush for a patient to use—as indicated by the patient's oral condition. Mechanical toothbrushes are also available with the following different types of strokes:

- The vertical stroke. The brush travels in an up and down arc.
- The horizontal stroke. The brush head moves in a back and forth motion.
- The circular stroke. The brush moves in a circular motion.

Toothbrushing methods. Except for normal, healthy adults, brushing techniques vary according to the type of treatment the patient is receiving—such as orthodontic, periodontal, or surgical. There are a number of toothbrushing methods that the dental officer may recommend. Most methods bear the name of the individual who originally described them in dental literature.

The current concept of tooth cleaning incorporates the use of a disclosing tablet. The disclosing tablet is a small tablet containing a dye that gives a red color to the normally invisible deposits of plaque. Chew a disclosing tablet and swish it around in your mouth. Rinse gently and examine your mouth to determine the areas of plaque accumulation. Take your toothbrush and point it at the teeth at a 45° angle. Lay the bristles in the sulcus area and use a "jiggling," scrubbing motion. Repeat this procedure in other areas of the mouth and clean until all the red color is removed from the teeth. After the red color is removed, run a piece of unwaxed dental floss between each contact point. Be careful not to snap the floss between the teeth; to do so could cause damage to the gingiva. If you experience pain during use of the brush or floss, you, too, should consult a dental officer.

Tell your patients to include their tongue in the maintenance of oral hygiene. If they have deep grooves or fissures on the surface of the tongue, caution them to examine their tongues frequently so that they can brush away any coating or discoloration. A coating may vary in color from light yellow to deep brown, depending upon what the patient has been eating or drinking. Small particles of food lodge in these grooves or cling to the papilla. This creates a coating. Since everything that is swallowed passes over the surface of the tongue, it should be brushed regularly. The tongue should be protruded and brushed lengthwise as well as from side to side. The patient may readily remove the coating by using this brushing technique.

Dentifrice. Most dentifrices (toothpaste or toothpowder) are composed of a flavoring, a detergent, and a polishing agent. Some dentifrices contain fluoride and are believed to be better because of the benefits derived from fluoride. In most cases, it is best to recommend a dentifrice that contains fluoride. A dentifrice may be supplied in either a paste or a powder. Pastes are composed of the same ingredients as powders. However, a binder (usually glycerin) and a lubricant are added to the powder to make a paste. The lubricant makes the paste easily squeezed from the tube. Patients who have sensitive, exposed root surfaces may need a desensitizing toothpaste. The effects of desensitizing toothpastes are usually temporary.

Dental floss and tape. Dental floss, or tape, is a strong, thin string of cotton or nylon, sometimes waxed for added strength and ease of use. Unwaxed dental floss is recommended because it does not leave a wax residue on the proximal surfaces of the teeth. Dental floss is necessary for removing plaque from between the teeth where a brush does not reach. Tell the patient to exercise care in the use of floss to avoid injuring the tissue between his teeth. Show the patient how to use the floss. When preparing to use it, cut a piece long enough to be wrapped around the index finger of each hand, leaving 1 or 2 inches extending between the fingers. Guide the piece of floss with the thumb of one hand and the index and middle fingers of the opposite hand. Hold the floss at such an angle that you can apply force against one tooth from the facial side. The floss is able to slide through the contact area but not against the tissue. Once the floss has passed through the contact area, press it against one tooth and move it gently down into the gingival crevice—form the letter "U" with the floss against the tooth and slide the floss up and down to clean the tooth's proximal surface. Follow the same procedure for the adjacent tooth. Then remove the floss by releasing the lingual end and pulling it through the embrasure. Explain to the patient that a toothbrush cleans only about 75 percent of the tooth surface. The remaining 25 percent of the tooth is the area most susceptible to caries and gum disease. Encourage the patient to use dental floss to clean this area.

Interdental stimulators. Although interdental stimulators are not recommended routinely, patients receive some benefit from using them. Interdental stimulators are gingiva massaging devices. Two common types are rubber and wood. The dental officer may recommend a toothbrush with a rubber tip on it for normal use and may stress use of the rubber tip for stimulation. Some periodontal patients may use wood stimulators. These are usually triangular wedges of wood. The periodontal patients may require massage of the interdental spaces (where the toothbrush bristles cannot reach). The normal healthy adult usually obtains the necessary massage from the bristles of his toothbrush.

Irrigating devices. These are sometimes recommended as an adjunct to normal toothbrushing. Irrigating devices use a small forced stream of water to clean and massage the oral tissues. The advantage of water-irrigating devices is that they remove debris that has been loosened with brush or floss from the gingival sulcus

Exercises (603):

1. What is the purpose of a good (home care) oral hygiene program?

2. Give the definition of home care.

3. List the items that may be used in the home care program.

4. What type of toothbrush is recommended for most dental patients?

5. What is the purpose of using disclosing tablets?

6. What type of motion is recommended for brushing your teeth?

7. Besides the teeth and gingiva, what other oral structure should be included in your brushing routine?

8. In most cases, what type of dentifrices should you recommend?

9. What is the primary purpose of using dental floss?

10. Why is unwaxed floss recommended?

11. After the floss has been slid through the contact area, how should it be positioned and used to clean the proximal tooth surface?

12. What is the function of interdental stimulators?

13. What type of patient would be the most likely to need the use of an interdental stimulator?

14. What is the advantage of the water-irrigating devices?

604. List the four basic food groups, state the nutrient requirements of the body and indicate the variance in caloric needs.

Diet—the Basic Four Food Groups. Another way the patient can limit the number of decay-causing microorganisms in his mouth is to have a nutritionally sound diet. You have heard the saying, "You are what you eat." Studies show that there is much truth in the saying; in a year's time 98 percent of our body atoms are replaced. This constant rebuilding indicates that adults as well as children need the nutrients found in a diet containing the basic four food groups. These groups are vegetable-fruit, milk, meat, and bread-cereal.

Each day our food should supply us with many different nutrients:

- Protein for growth and for repair of the body.
- Minerals and vitamins for growth and to keep the body functioning properly.
- Fats and carbohydrates for energy.

Most foods contain more than one nutrient. But no single food contains all the nutrients in the amounts we need. Therefore, choosing foods wisely means selecting kinds that together supply nutrients in the amounts needed. The following daily food guide indicates the way to choose food wisely. With it, you can get the nutrients needed from the variety of everyday foods.

In using the food guide, you select the main part of your diet from four broad food groups. To this, you add other foods as needed to make your meals more appealing and satisfying. When using this guide, you choose at least the minimum number of servings from each of the broad food groups. Serving sizes may differ—small for young children, extra large (or seconds) for very active adults or teenagers. Pregnant or nursing women also require more food from these groups. Make choices within each group according to suggestions given later. Foods within each group are similar, but not identical, in food value. Choose the additional foods to round out your meals both from foods in the four groups and from foods not listed in these groups. These additional foods should add enough calories to complete your food energy needs for the day. Children need enough food energy to support normal growth; adults need enough to maintain body weight at a level most favorable to health and well-being. Try to have some meat, poultry, fish, eggs, or milk at each meal.

Exercises (604):

1. List the four basic food groups.

2. What nutrients are needed in the daily diet, and how does each serve the body?

3. Place the following categories of people in order from those who need the most daily calories to those who need the least.

a. ________ Pregnant or nursing women.
b. ________ Small children.
c. ________ Active teenagers or adults.

605. State the body requirement for specific nutrients, name the available food sources, and indicate what association they have with tooth decay.

Vegetable-fruit group. The foods included in this group are all vegetables and fruits. This guide emphasizes those that are valuable as sources of vitamin C and vitamin A. Good sources of vitamin C are grapefruit or grapefruit juice, orange or orange juice, cantaloupe, raw strawberries, broccoli, Brussels sprout, green pepper, sweet red pepper, guava, mango, and papaya. Fair sources of vitamin C are honeydew melon, lemon, tangerine or tangerine juice, watermelon, asparagus, raw cabbage, collards, garden cress, kale, mustard greens, potatoes or sweet potatoes cooked in the jacket, spinach, tomatoes or tomato juice, and turnip greens.

Rich sources of vitamin A in the vegetable-fruit group are dark green and deep-yellow vegetables and a few fruits: apricots, broccoli, cantaloupe, carrots, chard, collards, cress, kale, mango, persimmon, pumpkin, spinach, sweet potatoes, turnip greens and other dark green leaves, and winter squash. Fruits and vegetables are valuable chiefly because of the vitamins and minerals they contain. In this plan, this group is counted on to supply nearly all the vitamin C needed and over half of the vitamin A. Vitamin C is needed for healthy gums and body tissues. Vitamin A is needed for growth, normal vision, and a healthy condition of the skin and other body surfaces.

It is recommended that you choose four or more servings every day to include the following:

- One serving of a good source of vitamin C or two servings of a fair source.
- One serving, at least every other day, of a good source of vitamin A. If the food chosen for vitamin C is also a good source of vitamin A, the additional serving of vitamin A food may be omitted.
- The remaining one to three or more servings may be of any vegetable or fruit, including those that are valuable for vitamin C and vitamin A.

Count as one serving: one-half cup of vegetable or fruit, or a portion as ordinarily served, such as one medium apple, banana, orange, or potato; half a medium grapefruit or cantaloupe; or the juice of one lemon.

Milk group. The foods included in this group are milk (fluid whole, evaporated, skim, dry, or buttermilk); cheese (cottage, cream, cheddar type—natural or processed); and ice cream (made from milk products). Milk is our leading source of calcium, which is needed for bones and teeth. It also provides high-quality protein, riboflavin, vitamin A, and many other nutrients.

It is recommended that everyone have some milk every day. Recommended amounts are given in terms of whole fluid milk in 8-ounce cups. Children under 9 need 2 to 3 cups. Children 9 to 12 and pregnant women need 3 or more cups, teenagers and nursing mothers need 4 or more cups, and adults need 2 or more cups. Part or all of the milk may be fluid skim milk, buttermilk, evaporated milk, or dry milk.

Cheese and ice cream may replace part of the milk. The amount of either necessary to replace a given amount of milk is figured on the basis of calcium content. Common portions of various kinds of cheese and of ice cream and their milk equivalents in calcium are these: 1-inch-cube cheddar-type cheese = 1/2 - cup milk; 1/2-cup cottage cheese = 1/3-cup milk; 2-tablespoons cream cheese = 1-tablespoon milk; and 1/2-cup ice cream = 1/4-cup milk.

Meat group. The foods included in this group are beef; veal, lamb; pork; variety meats such as liver, heart, and kidney; poultry and eggs; and fish and shellfish. As alternates you can use dry beans, dry peas, lentils, nuts, peanuts, and peanut butter. Foods in this group are valued for their protein, which is needed for growth and repair of body tissues—muscle, organs, blood, skin, and hair. These foods also provide iron, thiamine, riboflavin, and niacin. The amounts recommended are two or more servings every day. Count as a serving: 2 to 3 ounces of lean cooked meat, poultry, or fish—all without bone; 2 eggs; 1 cup cooked dry beans, dry peas, or lentils; and 4 tablespoons of peanut better.

Bread-cereal group. This food group is our cheapest and most abundant source of carbohydrates. The foods included in this group are all breads and cereals that are whole or restored grain (check labels). Specifically, this group includes breads, cooked cereals, crackers, flour, grits, macaroni and spaghetti, noodles, rice, rolled oats, and quick breads and other baked goods if made with whole grain or enriched flour. Parboiled rice and wheat also may be included in this group. Foods in this group furnish worthwhile amounts of protein, iron, several of the B vitamins, and food energy. It is recommended that you choose four servings or more daily. Count as one serving: 1 slice of bread; 1 ounce ready-to-serve cereal; 1/2 to 3/4 cup of cooked cereal, cornmeal, grits, macaroni, noodles, rice, or spaghetti.

To round out meals and meet energy needs, almost everyone will use some foods not specified in the four food groups. Such foods include unenriched, refined breads, cereals, and flours; sugars; butter or margarine; and other foods. These often are ingredients in a recipe or are added to other foods during preparation or at the table. Try to include some vegetable oil among the fats used.

Regarding diet and dental health, research has clearly shown there are "do's" and "don'ts" which should be observed. It is not our purpose, however, to tell anyone he cannot eat certain foods or that he must eat certain foods. This type of responsibility lies with the dietitians and physicians. Nevertheless, we should tactfully point out some of these "do's" and "don'ts" in the interest of dental health.

When you are conducting a preventive dentistry counseling, offer the following information for the patient's benefit:

a. High sucrose (sugar) diet. Research shows that patients who eat a high sugar diet have a high rate of tooth decay. Thus, suggest that the patient limit the intake of sugar foods to one meal a day and lower the total intake.

b. Sticky foods. Again, research shows that the use of sticky foods (carbohydrates, such as starch foods and soft candies) increases the rate of tooth decay. Suggest that the patient reduce his use of such foods.

c. Food substitutes. In view of the above suggestion, the patient should use substitute foods. In place of some sugars (not all), suggest the use of saccharides for example. If a patient insists upon snacking between meals, suggest that he eat nuts, carrot sticks, and fruits as substitutes for sugar and sticky foods. Since experts generally agree that the intake of reasonable amounts of sugar and other carbohydrates is needed for overall good health, be sure you don't imply that such foods should be excluded from the diet altogether. Instead, simply relate the research facts pertaining to these foods and recommend an intake reduction or substitution. In so doing, you have made the patient diet conscious in relation to dental health and have fulfilled your obligation in this respect.

Exercises (605):

1. Why does the body need vitamin C? List five good sources of vitamin C.

2. Why does the body need vitamin A? Which vegetables are rich in this vitamin?

3. Why are milk or milk products important to our diet?

4. Place the following categories of people in order from those who need the most milk to those who need the least.
   a. __________. Children under age 9.
   b. __________. Children age 9 to 12.
   c. __________. Nursing mothers.
5. What is the nutrient for which the meat group is most valued?

6. What food group is the cheapest and most abundant source of carbohydrates?

7. What type of diet is associated with a high rate of tooth decay?

8. If a patient insists on snacking between meals, what can you suggest as a substitute for sugar and sticky foods?

1-5. The Clinical Approach to Prophylaxis

This section is designed to provide you the information necessary to understand and perform the clinical procedures involved in oral prophylaxis. We begin by defining prophylaxis and discussing the deposits that may accumulate on the teeth. We then discuss the procedures involved in preparing for and performing the prophylaxis.

606. Define oral prophylaxis, state the purpose for prophylaxis, and identify and answer key questions concerning the deposits that accumulate on the tooth's surfaces.

Oral Prophylaxis. This term is defined as the use of preventive measures against diseases of the mouth. In our dental clinics, the term usually refers to scaling, cleaning, and polishing of the teeth—which may include preventive dentistry counseling and topical applications of anticariogenic agents. The removal of the various forms of mucinous and bacterial plaques (which cover neglected and unclean surfaces of the teeth) is of prime importance. It is in these plaques that dental calculus and stains first become impregnated and attach to the surface of the tooth. Acid that is produced by the bacteria within a plaque may be sufficient to decalcify the enamel and form the initial lesion of caries. Other organisms exert a toxic and irritative effect upon the gingival tissues. It is essential that you, the dental technician, remove all plaques and calculus from the patient's teeth by prophylactic measures, and (as previously mentioned) that you teach the patient to prevent the recurrence of these deposits by personal oral hygiene measures.

Irritants in the form of foreign matter (plaque, calculus) are the most common causes of periodontal diseases. However, many other factors may cause one to be susceptible to the disease. Some of these factors are the use of certain drugs, nutritional or endocrine disturbances, blood diseases (such as leukemia), overhanging restorations, open contacts, bacteria and their products, malocclusion, missing teeth, habits, and psychosomatic factors. You need only to recognize that these predisposing conditions do exist so that you may watch for them. Your job may require you to remove some of the local irritants; therefore, the following discussion is given to insure that you can identify the more common gingival irritants.

Some form of deposits can be found on the teeth

304

of most people. The importance of deposits such as plaque, calculus, stains, and materia alba in the etiology of periodontal disease is well established. As you study the following material and increase your knowledge of these deposits, you will develop improved techniques for removing them and for preventing their recurrence.

Materia alba and mucinous plaque. Materia alba is a soft, white deposit that forms around the necks of the teeth. It is composed of food debris, dead tissue elements, and purulent matter. Bacteria find these deposits an ideal place to grow. Mucinous plaques consist of a sticky substance that accumulates on the teeth. These plaques are composed of mucin precipitated from the saliva and of bacteria and their waste products. Both types of plaque cause gingival irritations. Mucinous plaques (when they become bacterial plaques) may form areas for the start of decay.

Stains. Discolorations in the mouth can be simply unsightly or contributing factors to the cause of periodontal disease. Stains can best be described according to their formation. There are basically two types of stains—extrinsic (external) and intrinsic (internal):

a. Extrinsic stains. The extrinsic stain that tobacco smoking causes is a dark diffuse discoloration on the surface of the teeth. The tar products of the burning tobacco are responsible for the condition rather than nicotine. Two additional types of dark brown or black stains are known. These are not associated with tobacco. They occur in both sexes at all ages. They appear as a continuous line around the neck of the tooth near the gingival margin. The exact cause of this extrinsic stain is not known. It is presumed to be due to chromogenic bacteria (color-producing bacteria). The other type of black or brown stain is due to silver nitrate, a chemical that is sometimes used to prevent dental caries in children.

b. Chromogenic bacteria. Chromogenic bacteria can also cause a green stain on teeth. This condition may be found on the neck or apical half of the crowns of anterior teeth. It is frequently found in children, and its contributing cause is poor oral hygiene. Orange and red stains are rare compared to brown or black stains. The orange and red stains are believed to be associated with chromogenic bacteria, also. They are more common among children than adults.

c. Intrinsic stains. These are internal stains most often caused by blood pigments. When there is hemorrhage in the pulp chamber due to trauma or death of the pulp, the blood seeps into the dentinal tubules. The hemoglobin in the red blood cells breaks down, and its high content of iron is deposited in the tubules. This discoloration can be seen through the translucent enamel of the teeth; it appears as shades of slate gray to black. Another intrinsic stain is an irregular brownish-yellow discoloration of mottled enamel. This is most probably caused by too high a fluoride content in the water supply.

Calculus. Calculus is divided into two classes. The first is a hard, calcified substance called supragingival or salivary calculus. It accumulates on the exposed portions of the teeth. This type of calculus is composed of a mixture of calcium salts and organic matter. It is thought to be deposited from the saliva. When first deposited, it is soft and sticky. The color is cream or gray—not much darker than enamel. The color may be modified by food and smoking. It is readily removed by brushing during the first few days of accumulation. The deposits become harder, more dense, and adherent to the tooth surface if they are not removed during this early period.

The second type is subgingival calculus and is also believed to be deposited from the saliva. It is the chief cause of gingival inflammation that progresses into periodontitis. As its name implies, it is located under the free gingiva. Subgingival calculus is usually much darker and harder than supragingival calculus and is gritty and sharp in texture. This accounts for the ability of the calculus to cause inflammation and bone loss.

Calculus accumulates more in certain areas than in others. The salivary glands empty their contents into the mouth as do the small mucous glands which are distributed throughout the mucous membranes. The combined secretions of all the glands form the saliva. The duct opening of the parotid gland is located just opposite the maxillary second molar. The sublingual and submandibular glands empty their secretions onto the floor of the mouth just lingual to the mandibular incisor teeth. Consequently, the facial surfaces of maxillary molars and lingual surfaces of mandibular incisors are prime areas for the accumulation of calculus.

In the earliest stages, calculus is deposited in the form of small flakes. It gradually forms a line around the tooth just above the free margin of the gingiva. This inflames the margin of the gingiva. Then the calculus deposit and the bacteria that have been incorporated into the mass at the gingival margin contribute to the inflammation. As the deposits increase in size, they form a framework for an increasingly rapid buildup of calculus. The deposit of calculus becomes so large that it strangles the blood supply to the interdental papillae—and gingival recession begins. The epithelial attachment begins to migrate down the root surface. Destruction of the periodontal membrane and alveolar bone proceeds until the tooth becomes mobile. Finally, unless adequate treatment is instituted, the tooth is lost. Performing routine prophylaxis can, of course, help prevent the development of severe periodontal conditions.

Exercises (606):

1. Define the term "oral prophylaxis."

2. What is prevented by performing a routine oral prophylaxis?

Complete items 3 through 8 by matching the description that appears in column B to the appropriate deposit in column A.

Column A

____ 3. Mucinous plaque.
____ 4. Subgingival calculus.
____ 5. Extrinsic stain.
____ 6. Intrinsic stain.
____ 7. Supragingival calculus.
____ 8. Materia alba.

Column B

a. Black, brown, or green deposits caused by tobacco or chromogenic bacteria.
b. A soft, white deposit composed of food debris, dead tissue elements, and purulent matter that forms around the necks of teeth.
c. A sticky substance composed of mucin precipitated by saliva and bacteria and their waste products.
d. A condition due to hemorrhage in the pulp chamber or too high a fluoride concentration in drinking water.
e. A hard calcified deposit that accumulates on the exposed surfaces of the teeth.
f. Dark, hard, gritty deposits located under the free gingiva.

9. Name the teeth and their surfaces that are considered the prime areas for the accumulation of calculus.

10. What process begins when buildups of calculus strangle the blood supply to the interdental papillae?

607. Given a series of statements concerning the preparatory procedures for oral prophylaxis, determine which are true and which are false.

Preparation for Oral Prophylaxis. Prior to performing an oral prophylaxis, you must perform several preparatory functions. Our discussion of the preparatory phase includes evaluation of records, seating the patient, instrument examinations, and contraindications to prophylaxis. Let's begin our discussion with the evaluation of the patient's dental health record.

Evaluation of records. Before the patient enters the operatory, evaluate his record. Check it for completeness. The folder should contain his dental record; current X-rays; AF Form 696, Dental Patient History; and other applicable forms as discussed previously. Check his past medical history and his past history of periodontal disease. Check the recommendations that were made during previous preventive dentistry counseling. If the patient has had a class 5 examination, evaluate the panoramic X-rays for subgingival calculus and irritation. The few minutes that you spend evaluating his records tell you much about your patient. They help you evaluate his home care habits and possibly his attitude toward the care of his teeth. After you evaluate the record and perform all between-patient housekeeping, you are ready to seat the patient.

Seating the patient. Seat the patient in the chair in a position that affords you the best view of the oral cavity. You can work either seated or standing. If you prefer to work standing, raise the chair so that the patient's mouth is approximately at your elbow. For the sitting position, adjust the stool and chair so that you are comfortable and so that your posture is correct. Check the patient for comfort. Be sure that the chair position is within the limits of operation. (The patient should not have to stretch to reach the cuspidor; nor should you have to lean over the patient to reach the water and air syringes.) If possible, position the bracket tray out of the patient's direct vision. You should have thoroughly scrubbed your hands before the patient entered. After the patient is seated, wash your hands in full view of the patient so that he will know that your hands are clean. Now you are ready to examine the patient's mouth.

Instrument examination. Before you begin any scaling procedures, make a thorough appraisal of the condition of the patient's mouth. This examination serves three purposes—it determines the needs of the patient, determines the sequence in which these needs must be met, and provides you with useful information for conducting the preventive dentistry counseling. Be sure that the dental light is properly adjusted so that you can adequately view the oral structures.

This examination has two phases—observation of the entire oral mucosa, and examination of the teeth and gingival sulcus. In the first phase, inspect the lips; then move intra-orally to the labial, buccal, and vestibular mucosa. Examine the oral pharynx, retromolar area, maxillary tuberosity, soft palate, and hard palate. Pay particular attention to the tongue and the sublingual mucosa. In the second phase, examine the gingival sulci to determine their depth. Examine the teeth below the gingiva for the presence of subgingival calculus. You can do this with a mouth mirror and explorer. A blast of air directed into the gingival sulcus also aids in the detection of subgingival calculus. Examine the teeth for stains, soft and hard deposits, defects, and dental caries. The use of disclosing tablets will aid you greatly in detecting the soft deposits on the teeth and is a valuable aid when you conduct your preventive dentistry counseling. Disclosing tablets and preventive dentistry counseling are discussed in other parts of this volume.

Don't try to make a diagnosis, but recognize deviations from the normal—especially those which relate to the oral prophylaxis technique. The first phase of the examination may reveal such conditions as lesions and manifestations of virus infection that prohibit the continuation of the appointment. Be alert for all of the types of oral pathology we discussed in Volume 2. Bring any condition that might be a contraindication to prophylaxis to the attention of the dental officer.

Contraindications to prophylaxis. All dental patients must be evaluated for medical history before a course of treatment begins. AF Form 696, Dental Patient History, must be completed for all patients. The purpose of this form is to find out if there are any medical problems that can affect dental treatment. In addition to oral pathology, there are many medical problems that are contraindications to prophylaxis as well as to other types of dental treatment. Many of these conditions require special precautions.

You are responsible for reviewing each patient's medical history. Any medical history, no matter how complete, is only as good as the person who uses it. There are a number of questions on the form. Discuss each question. All "yes" answers must be further questioned as to what, when, where, how much, and how long. We will discuss each question on AF Form 696. Expand each "yes" answer in the following way:

a. Heart conditions. If the patient has a history of angina pectoris, he probably carries his own nitroglycerin tablets. CAUTION: Nitroglycerin must be available at the time of treatment. If it is needed, place the tablet under the patient's tongue. You should avoid stress for patients who have suffered a coronary occlusion. Many of these patients are on anticoagulants. If the patient has high blood pressure (hypertension), avoid anything that may raise his blood pressure. Always check with the dental officer before treating these patients.

b. Diabetes (sugar diabetes). Patients with a history of diabetes are slow healers and are subject to infection. Antibiotics may be necessary. Check with the dental officer before treatment.

c. Kidney and liver disease. Ask these patients what, when, and how long? If there has been liver or kidney damage, local anesthetics should not be given. Check with the dental officer.

d. Rheumatic fever. Question these patients as to when, where, and how affected. Fifty percent of these patients have had some damage to the heart valves. Their treatment is the dentist's responsibility. Call his attention to any history of rheumatic fever. These patients must be premedicated with penicillin or other antibiotics. Failure to premedicate these patients can be grounds for a malpractice suit.

e. Prolonged bleeding. Ask the patient the following questions about bleeding. Why? How much? How long? Is he a slow bleeder or oozer? These patients may be on anticoagulants. If the patient is on anticoagulants and if the dosage must be reduced for dental treatment, it must be done by a physician.

f. Reaction to local anesthetic. There are various types of reactions to local anesthetic. Neurogenic (nerve) reaction is the most common. Epinephrine in the anesthetic causes the veins to constrict, and this increases the blood pressure. Toxic (poison) reactions are rare and usually result from a large dose. An allergic reaction to local anesthetic is rare. Local anesthetic is considered a very safe drug.

g. Allergies. If the patient has a history of allergies, find out what he is allergic to. Ask what type of reaction he has had, and how long after the injection it occurred. Record all information that the patient gives you. If he is allergic to drugs, such as penicillin or novocaine, be sure to make the appropriate entries on his dental records.

h. Under the care of a physician. If the patient has been under the care of a physician during the past year, ask him for what, when, and where? Is he taking medication? What kind? Has he taken cortisone? If the patient is being treated for a condition that may be a contraindication to prophylaxis, check with the dental officer. It may also be necessary to check with the physician before you render dental treatment.

i. Infections. For patients with a history of recent infections, ask them what infection, when, how long, how often, and what treatment they received. If a patient has a history of existing infection or numerous infections in the past, he probably has lowered resistance, increased susceptibility, and slower postoperative recovery. Discuss the patient's history with the dental officer.

j. Complications following dental treatment. If a patient indicates that he has had complications following dental treatment, find out what, when, and why. Try to uncover the complications that the patient relates to dentistry, such as infection, nausea, fainting, and bleeding. This relates the patient's past history to the complications you can expect in the future.

k. Condition of present health. Have the patient indicate what he feels is the condition of his present health. If the patient has answered all previous questions with a "no," and then states that the condition of his present health is "fair" or "poor"—question him about this.

Disclosing chemicals. You apply disclosing agents to the teeth before prophylaxis procedures. These agents reveal the presence of deposits and stains. They are especially useful for staining plaque, which is impossible to see without these agents. You also use disclosing chemicals to assist in patient education techniques. These agents color the deposit or stain, but they do not color clean tooth surfaces. The disclosing tablets are an indispensable part of the recommended method of cleaning discussed later in this volume.

The coloring agent used in disclosing tablets is an erythrosin dye, a harmless red food coloring. The disclosing tablets are listed in the 6505 class in the *Federal Stock Catalog*. You may also use a 4-percent solution of basic fuchsin as a disclosing solution.

To use basic fuchsin, dry the teeth with compressed air, and apply the solution with a cotton applicator or a cotton pellet in cotton pliers. During the application of the solution, retract the patient's tongue, lips, and cheeks to provide access to the teeth and to avoid staining the oral mucosa. Instruct the patient to rinse thoroughly after the solution has been applied. The use of disclosing tablets is much more convenient. Have the patient chew the tablet and then rinse thoroughly. Inspect the teeth with a mouth mirror, using compressed air to move the papilla for better viewing of the sulcus area. Give the patient a hand mirror to observe his own mouth while you are performing the examination.

Exercises (607):

Indicate whether the following statements concerning the preparatory procedures for oral prophylaxis are true (T) or false (F) by circling the appropriate T or F.

T F 1. Before the patient enters the operatory, you should evaluate his dental records.

T F 2. Of prime concern during a preprophylaxis records evaluation is the dental health record chart of "Diseases and Abnormalities."

T F 3. Panographic radiographs can aid you in locating subgingival calculus.

T F 4. Once the seating procedure is completed, you should wash your hands in full view of the patients.

T F 5. When performing an oral prophylaxis, you should always work from a standing position.

T F 6. The purposes of the instrument examination are to determine the needs of the patient, determine the sequence in which these needs must be met, and to provide useful information for conducting the preventive dentistry counseling.

T F 7. The preprophylaxis examination has two phases—observation of the entire oral mucosa, and examination of the teeth and gingival sulcus.

T F 8. A blast of air directed into the gingival sulcus is useful in determining the presence of supragingival calculus.

T F 9. If the patient has a history of angina pectoris, nitroglycerin must be available at the time of treatment.

T F 10. Patients with a history of rheumatic fever must be premedicated with an antibiotic drug.

T F 11. Patients with an existing infection or numerous past infections probably have a lowered resistance, and you should discuss such histories with a dental officer.

T F 12. Disclosing agents should be applied to the teeth before prophylaxis to reveal the presence of deposits and stains.

T F 13. The coloring agent in disclosing tablets is basic fuchsin, which serves to color the deposits while not affecting the clean tooth surfaces.

T F 14. To use disclosing tablets, have the patient chew the tablet and then rinse thoroughly.

608. State the purpose of tooth-scaling procedures, cite the factors that influence instrument selection, name the instrument grasps, and indicate the proper procedures for establishing a fulcrum.

Oral Prophylaxis. As you probably recall, we earlier defined oral prophylaxis as the clinical procedures, relating to the prevention of oral diseases, that you perform for the patient.

Tooth-scaling procedures are used to remove calculus from the tooth surfaces. Basically, this consists of using various scaling instruments to mechanically fracture the calculus deposits from the tooth's surface. It is relatively simple to remove large deposits of supragingival calculus, but the removal of small pieces of subgingival calculus in deep periodontal pockets is exceedingly difficult. Calculus deposits can extend down the root to the depth of the sulcus or pocket. You must remove all of the calculus from the teeth in order to eliminate the source of irritation to the periodontium.

When you remove the source of irritation, the existing inflammatory response subsides. In the case of simple gingivitis, the gingiva usually heals completely and no further treatment is needed. When

308

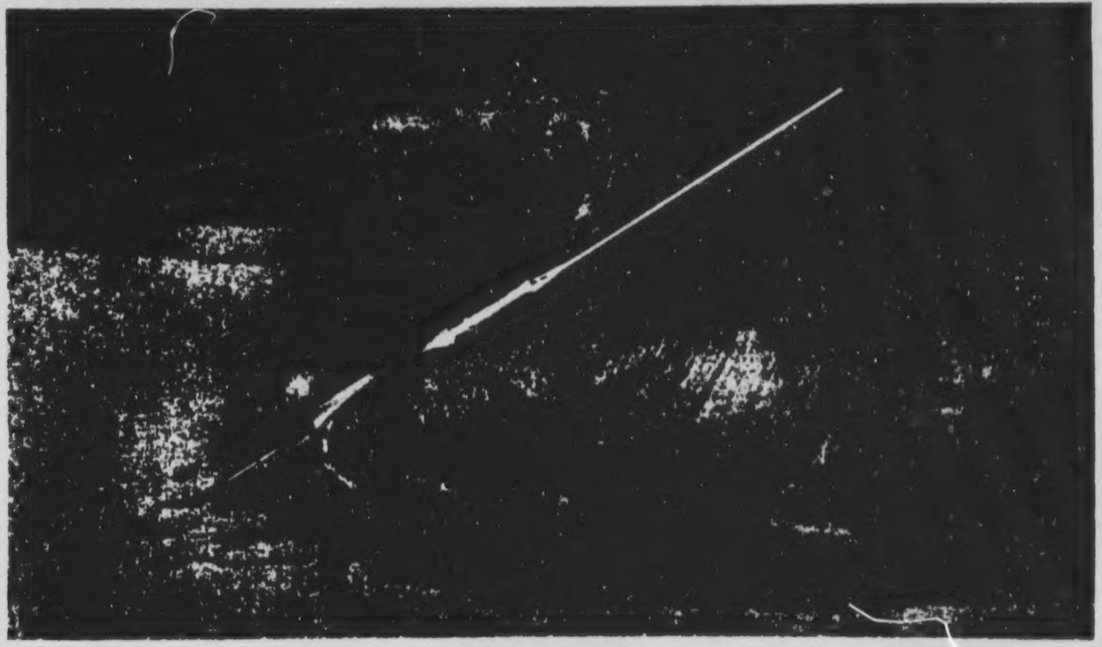


Figure 1-1. The pen grasp.

deep periodontal pockets remain, pocket elimination procedures are usually indicated. The surgical eradication of pockets should be done by the dental officer.

Instrument selection. Primarily, your choice of instruments is determined by the amount of calculus present in the patient's mouth. If the patient has a large amount of supragingival calculus or heavy stain, you would probably be wise to start your scaling procedure with the cavitron. After you have removed the gross supragingival calculus, you may choose to complete the entire procedure using the manual hand instruments. The cavitron may be used only to remove supragingival calculus, whereas the manual hand instruments are effective for removing both supragingival and subgingival

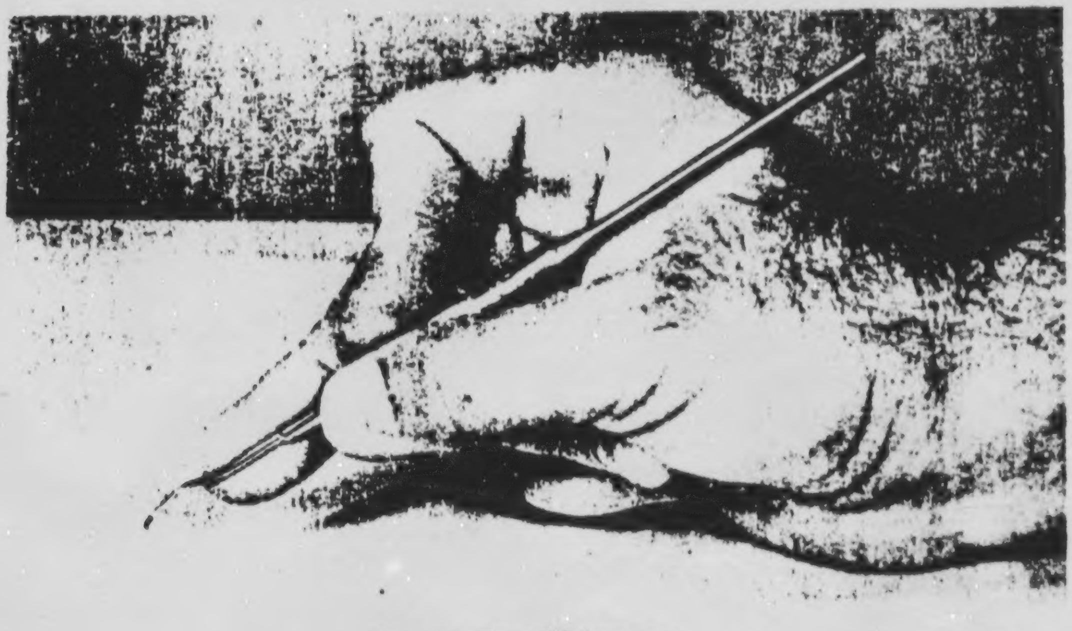


Figure 1-2. The modified pen grasp.

315

calculus. The scaling instruments were discussed in Volume 2 of this CDC. You would probably be wise to review them at this point in your study of oral prophylaxis procedures.

Instrument grasps. Using a correct instrument grasp is an important part of instrumentation. It has a direct bearing upon your ability to manipulate instruments. There are three instrument grasps that you may use during oral prophylaxis procedures:

(1) With the *pen grasp*, hold the instrument the way you hold a pen in writing. This grasp is shown in figure 1-1. Activate the instrument with a rolling motion.

(2) With the *modified pen grasp*, hold the instrument in basically the same way as in the pen grasp, except that you move your middle finger onto the shank of the instrument. This grasp is shown in figure 1-2.

(3) In the *palm grasp*, place the instrument across the first phalange of your fingers. Then flex your fingers over the handle into the palm of your hand. Leave your thumb free. The palm grasp is shown in figure 1-3. This grasp is useful when you need exceptional force.

Use a fulcrum to maintain control of the instrument. A fulcrum may be defined as a firm finger rest. You should use a fulcrum in the same arch as the working area and as close to the working area as possible. In the modified pen grasp, the middle finger is most often used as a fulcrum. The finger used for a fulcrum can rest on the teeth, the gingiva, another finger, or a combination of these. Do not use soft movable tissue for a fulcrum. When you are holding the instrument in the pen grasp, use your third (or ring) finger as the fulcrum. When using the palm grasp, use your thumb for the fulcrum.

Exercises (608):

1. What is the purpose of tooth-scaling procedures?

2. Why must all calculus be removed from the teeth?

3. What is the primary factor in instrument selection?

4. What instrument would be a wise choice to start the scaling procedure on a patient who has a large amount of calculus and heavy stain?

Figure 1-3. The palm grasp

5. Which instruments are effective for removing both supragingival and subgingival calculus?

6. Name the three instrument grasps?

7. What instrument grasp is useful when you need exceptional force?

Items 8 through 11 are statements that relate to establishing a fulcrum; indicate whether each statement is true (T) or false (F) by circling the appropriate T or F.

T F 8. A fulcrum is used to maintain control of the instrument.

T F 9. A fulcrum should be established in the arch directly opposite the working area.

T F 10. When using the palm grasp, use the ring finger for the fulcrum.

T F 11. A fulcrum should always be established on hard tissues such as the teeth.

609. Given a series of statements concerning the systematizing of the periodontal scaling routine, indicate which are true and which are false.

Periodontal Scaling Procedure. You should approach each patient with a specific plan of treatment. This plan will, of course, vary with the individual patient's needs. Most patients who have frequent prophylaxis treatment and adequate oral hygiene need only one appointment. Patients who have been neglectful of their oral health, such as those with periodontitis, usually require several appointments. Regardless of whether the scaling can be completed in one sitting or in several sittings, you should approach the scaling task systematically.

Systematizing the procedure. If the patient has gross supragingival calculus deposits, you should first remove them. These deposits are easy to locate and are usually relatively easy to remove. The cavitron is particularly useful for performing the gross scaling. The cavitron is recommended only for the removal of supragingival calculus. The technique is similar to that used with other hand instruments except that application must be in a continuously wet field. Apply the tip in a gentle, short, rapid, massaging stroke. Overlap the strokes and repeat as necessary until all the deposits are removed. Keep the tip moving constantly while it is touching the teeth. The use of a light touch produces satisfactory results.

As you begin your hand scaling with the curettes, you should divide the mouth into work segments. The most widely used segmentation method is to divide the mouth into quadrants. Each quadrant begins with a central incisor and extends posteriorly to include the third molar. When scaling patients with advanced periodontitis, you may be able to scale only one quadrant during the first appointment and one quadrant during each subsequent appointment. When more than one appointment is needed, reevaluate the areas previously scaled during each subsequent appointment. You may find calculus deposits that were left and must be removed at this time. If the entire scaling is to be performed during one appointment, you should still complete an entire quadrant before you begin the next quadrant. Skipping haphazardly from one area of the mouth to another may cause you to miss some areas and usually results in wasted time. As you begin your work within each quadrant, try to use each instrument in all the places indicated by its design before changing to another instrument.

Exercises (609):

Indicate whether the following statements concerning systematizing the periodontal scaling routine are true (T) or false (F) by circling the appropriate T or F.

T F 1. Systematizing of the periodontal scaling procedure provides for the same treatment plan for each patient.

T F 2. If the patient has gross calculus deposits, periodontal curettes are usually the first instrument used in the scaling routine.

T F 3. The use of long, slow, medium to heavy strokes with the cavitron is an effective way to remove subgingival calculus after the gross scaling has been completed.

T F 4. Prior to beginning your hand scaling, you should divide the mouth into work segments. The most widely used segmentation approach is accomplished by dividing the mouth into quadrants.

T F 5. When scaling the teeth, you should remove the deposits from all the aspects of one tooth before you start to scale another tooth.

610. Given a series of incomplete pertinent statements concerning the operating position of the technician during oral prophylaxis, supply key words that complete the statements.

Positions of the technician. After seating the patient, adjust the chair so that both you and the patient are comfortable. Try to work from a position where your working area is lower than your heart. This will help prevent your hand and arm from becoming fatigued. You may work from either a standing or a sitting position. Most technicians, however, prefer a sitting position as they find that it leaves them less tired at the end of the work day. Operating from the seated position has another advantage as it allows you to view most areas without having to look in the mouth mirror. Most technicians find that the scaling procedure can be performed faster and more efficiently if they have a direct view of the operating area. If you do choose to stand, distribute your body weight equally on both legs. Whether you stand or sit, maintain a good posture by keeping your back straight.

Exercises (610):

1. To prevent your hand and arm from becoming fatigued, you should work from a position where the working area is ____ than your ____.
2. Working from the seated position is less tiring and allows you to view most oral structures without having to use the ____ ____.
3. If you work from the standing position, you should distribute your ____ equally on both ____.
4. Whether you stand or sit, maintain a ____ ____ by keeping your ____ ____.

611. Indicate the actions and the purposes of the actions that both directly and indirectly show thoughtfulness to the patient by answering a series of key questions.

Thoughtfulness to the patient. As you perform the prophylaxis procedure, remember that you are working on a living, breathing human being. You must accomplish your tasks in a manner that does not psychologically irritate the patient. Remember, your job is not to chastise the patient for his past neglect, but to rehabilitate and educate him toward improved oral hygiene. Be as gentle as possible during the scaling procedure so that you don't needlessly injure the tooth or its surrounding tissues. Frequently irrigate the scaling site to prevent particles of calculus from becoming implanted in the gingival tissues. Be careful when you retract tissue with the mouth mirror, because too vigorous a retraction can be extremely uncomfortable to the patient.

Studies show that periodontal scalings performed with sharp curettes produce smoother root surfaces than do other scaling methods. You cannot do a good job unless you use sharp instruments. The use of dull instruments not only results in an inadequate procedure but is a waste of time and effort. Additionally, dull instruments are hard to control. They could easily slip off the scaling surface and cause an unnecessary laceration or puncture-type wound in the patient's lips, cheeks, or palate. So, after use on each patient, check your instruments and sharpen them if necessary.

As you place your instruments on the bracket table, place them in the order they are going to be used. For instance, if you are going to scale the anterior area first, place the curette you will need in the first position on the bracket table. This prevents you from having to search through your instrument setup to find the one you need. Color coding tape can also aid you in quickly finding the instrument you need. Since the curettes are paired, you can identify both instruments of the pair with the same color of tape. When you wish to change from one instrument of the pair to the other, you can select it readily by the color of the tape you have placed on its handle. Patients can easily lose confidence in a technician who must frequently change instruments in an effort to find the right one to scale a particular area. No matter how well organized your instrument setup is, occasionally you will pick up the wrong instrument. When this occurs, it is a good idea to go ahead and briefly use the instrument rather than indicating your error to the patient by immediately changing instruments. You must consistently do everything in your power to gain and maintain your patient's confidence.

When you are scaling, you will occasionally need to remove calculus and debris from the working end of your instrument. This can be accomplished in one of several ways. You can place a dappen dish containing hydrogen peroxide on the bracket table and simply dip the instrument tip into the solution. You could also wipe the instrument off on a gauze sponge that can either be attached to the towel chain or held in your nonscaling hand. Avoid wiping the instrument directly on the patient towel as blood or debris from your hands or the instrument could stain the patient's clothing.

Exercises (611):

1. What should you consider as your job in an effort not to psychologically irritate the patient?

2. Why should you be as gentle as possible during the scaling procedure?

3. How can you prevent calculus particles from becoming implanted in the gingival tissues?

4. Why should you be careful when you retract tissues with the mouth mirror?

5. Give three reasons for using sharp instruments for the scaling procedure.

6. When placing instruments on the bracket table, what action can you take to make it easier to find the instrument you will want to use at the time you want to use it?

7. How can you code paired instruments to make them easier to identify?

8. Why should you make an overt effort not to change instruments frequently when trying to find a suitable instrument to scale a particular area?

9. Why should you clean your instrument tip on a gauze sponge or in a dappen dish containing hydrogen peroxide rather than wipe it on the patient towel?

612. Relate the various methods employed to locate calculus, and indicate in which oral area calculus is most difficult to locate.

Locating the calculus. The actual scaling process

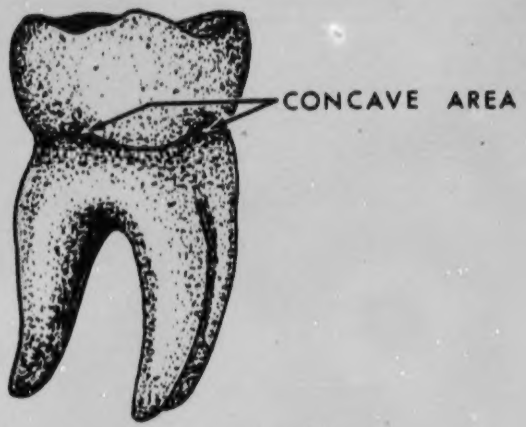


Figure 1-4. Furcation grooves.

begins after the deposits of calculus are located. Drying the teeth with a stream of warm air helps to expose supragingival calculus. Disclosing chemicals can also assist you in locating the supragingival calculus deposits. Some subgingival deposits can be seen if you direct the air stream into the gingival sulcus. Pay particular attention to areas where gingival inflammation is apparent. Deposits in the periodontal pocket cannot usually be seen. To locate these deposits, you must depend on your sense of touch. By inserting an explorer or a fine curette into the pocket area, you can usually feel the calculus deposits as they characteristically have a rough flintlike texture. The most difficult areas for the location and removal of calculus deposits are the concave grooves leading into the furcation areas of multirooted teeth. These areas are located on the root surface just below the cervix. Figure 1-4 illustrates typical furcation grooves.

Exercises (612):

1. What chemicals can assist you in locating supragingival calculus?

2. Into what area should you direct a stream of air to locate subgingival calculus?

3. What must you depend upon to locate calculus deposits in the periodontal pocket?

4. What texture do the calculus deposits in periodontal pockets characteristically have?

5. What is the most difficult area in which to locate and remove calculus deposits?

613. Given a series of statements concerning the instrumentation involved for calculus removal, indicate which are true and which are false.

Instrumentation. Once you have located the

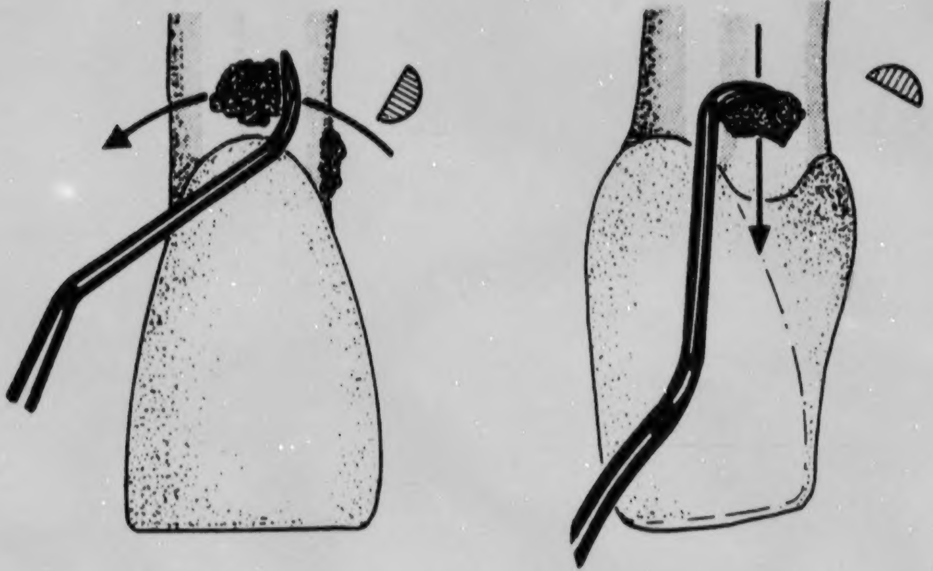


Figure 1-5. Basic scaling strokes.

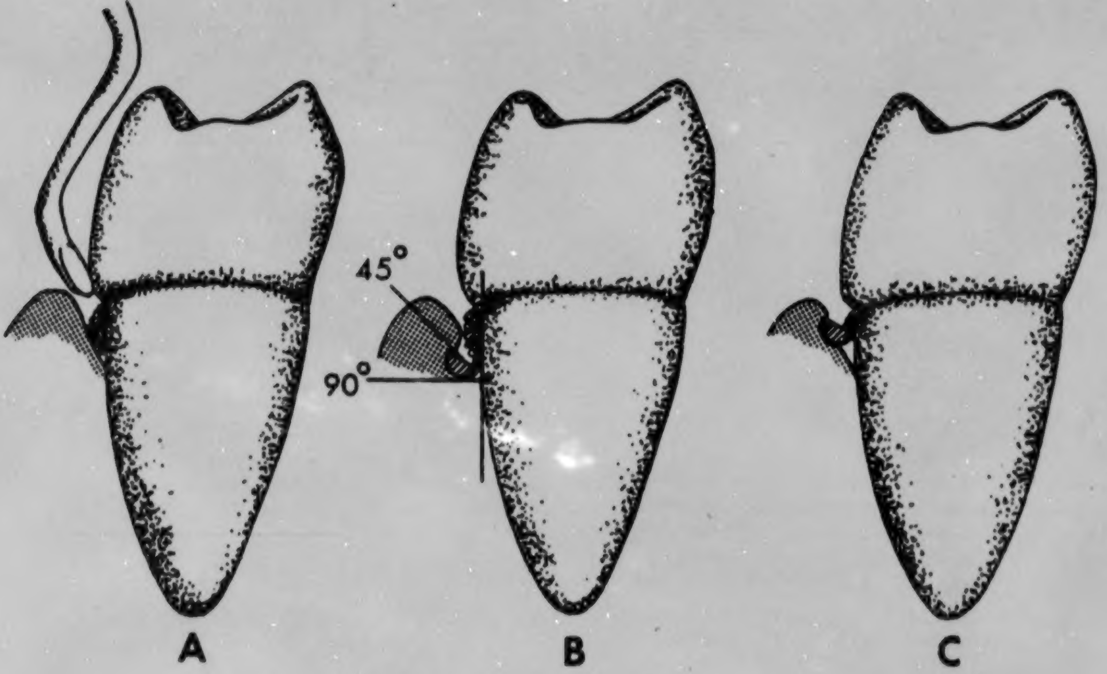


Figure 1-6. Phases of the vertical stroke.

calculus deposits, you are ready to perform the instrumentation necessary to remove them. There are two basic scaling strokes. The first is the vertical stroke which parallels the long axis of the tooth. The vertical stroke is usually used to remove calculus from the proximal surfaces of the teeth. The other stroke is the horizontal stroke which parallels the cervical line. This stroke is used to remove deposit from the facial and lingual surfaces of the teeth. The vertical stroke is considered the safest scaling stroke to use as the instrument's cutting edge does not come in contact with the epithelial attachment. Do not use the horizontal stroke in cases where probe measurements show that the sulcus depth is uneven, as the curette will be dragged into the epithelial attachment at the higher areas. Even in cases where the sulcus depth is uniform, you should exercise extreme care when using the horizontal stroke. The vertical and horizontal strokes are illustrated in figure 1-5. These strokes must often be altered slightly to an oblique or diagonal direction in order to scale all of the tooth's surfaces.

There are three distinct phases to each scaling stroke, the exploratory phase, the positioning phase, and the working phase. Refer to figure 1-6 as we discuss these phases. Figure 1-6,A, shows the exploratory phase of the stroke. Prior to beginning this stroke, establish your finger rest on a dry, firm tooth structure as close as possible to the tooth being scaled. Gently insert the curette under the gingival margin. Grasp the curette lightly and move it down toward the base of the gingival sulcus. Keep the curette's tip in light contact with the calculus or tooth surface and continue the downward movement until you feel the tension of the soft tissue attachment.

Once you reach the base of the sulcus, you are ready for the positioning phase. This phase is illustrated in figure 1-6,B. The blade should be positioned at the apical aspect of the deposit and should form a 45° to 90° angle with the tooth. If the angle is less than 45°, your working stroke will probably slip over the deposits. If it is more than 90°, there is a danger of gouging the root surface. After the instrument is properly positioned, you are ready to initiate the working phase of the stroke.

Prior to initiating the working phase of the stroke, you should tighten your grip on the instrument. Your hand, wrist, and arm should be used to activate the instrument. Avoid scaling with independent finger movements as this technique is extremely fatiguing. Your working stroke should be short, controlled, decisive, and directed in a manner to protect the tissues from trauma. The short stroke helps to maintain control of the instrument and permit adaptation of the cutting edge to variations in the tooth's surface. The exact length of the stroke is dependent on the height of the deposits. During the working stroke, you should slightly increase the pressure on the fulcrum to balance the pressure of the instrument on the tooth

314

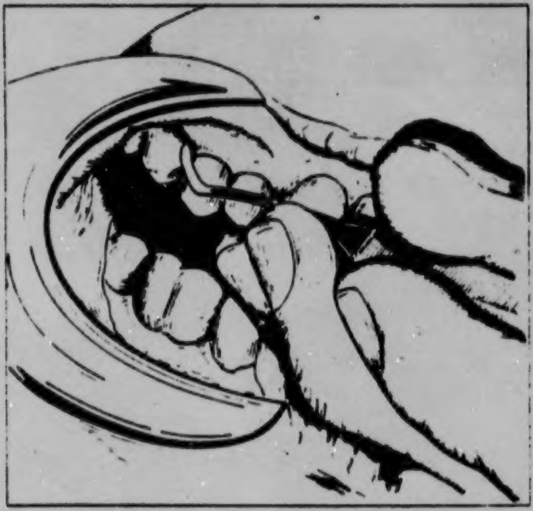


Figure 1-7. Maxillary right posterior, facial and proximal position.

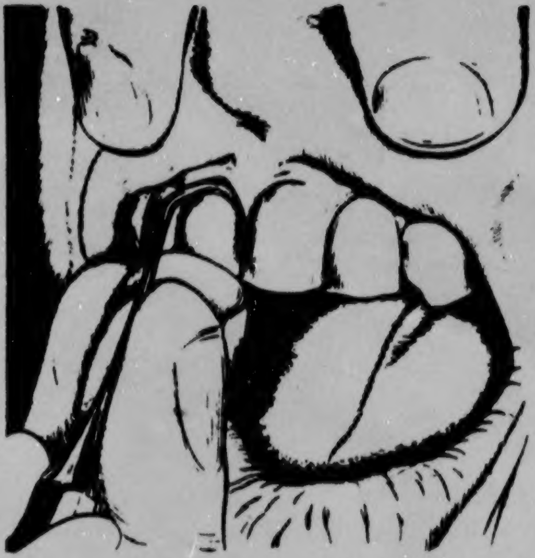


Figure 1-9. Maxillary anterior, facial and proximal position.

being scaled. The working stroke is shown in figure 1-6,C.

Try to work within the boundaries of the pocket or sulcus to eliminate the need for repeated withdrawal and reinsertion of the curette. Doing this not only saves time but also reduces the number of times that the instrument must be passed over the tooth's highly sensitive neck and gingival margin, where the enamel and cementum is thinnest. Whenever possible, remove the whole thickness of calculus in one piece. Never remove calculus by shaving it off in layers. Shaving often leaves a thin layer of calculus which is difficult to distinguish from the tooth's surface. This thin layer can serve as a nucleus for new plaque and calculus formations. Frequently irrigate the pocket and sulcus areas to prevent implantation of calculus deposits into the underlying tissues. Figures 1-7 through 1-18 illustrate the suggested instrument and finger rest positions for scaling in different areas of the mouth. After you have completed the scaling procedure, you are ready to polish the teeth.

Exercises (613):

T F 1. The horizontal scaling stroke should be used in areas where the sulcus depth is uneven.

T F 2. The vertical scaling stroke parallels the long axis of the tooth and is usually used

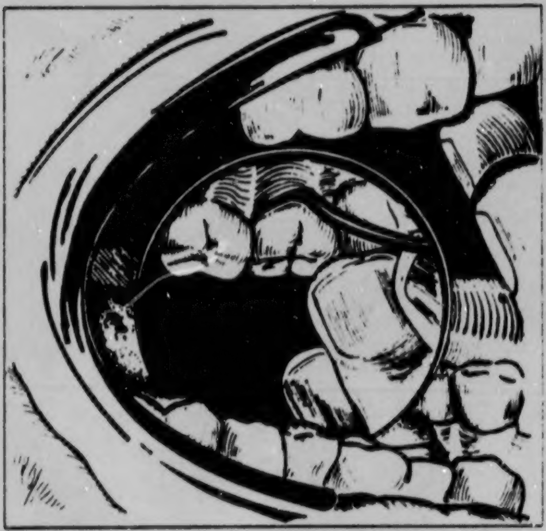


Figure 1-8. Maxillary right posterior, lingual position.

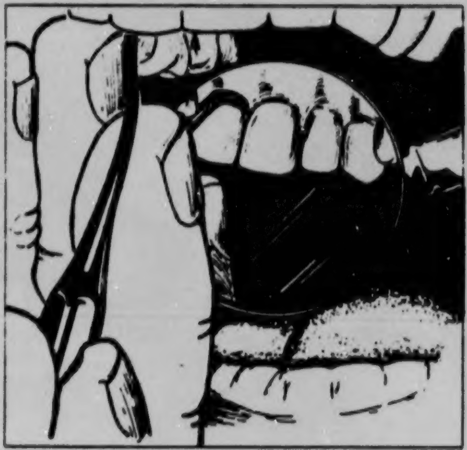


Figure 1-10. Maxillary anterior, lingual position.

315

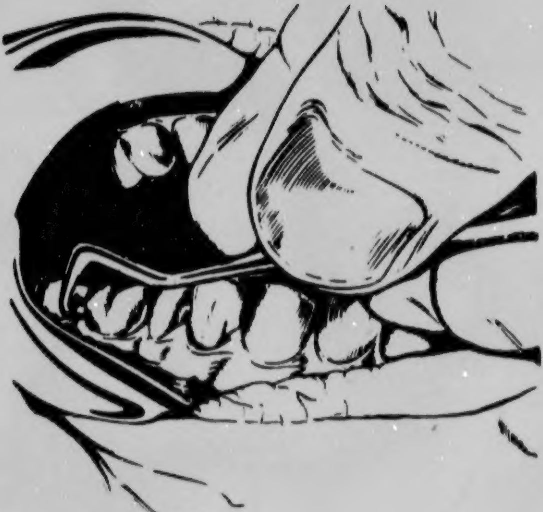


Figure 1-11. Maxillary left posterior, facial and proximal position.

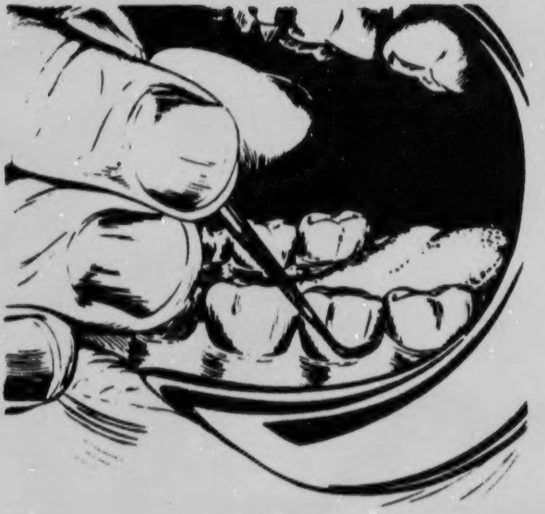


Figure 1-13. Mandibular left posterior, facial and proximal position.

to remove calculus from the proximal surfaces of the teeth.

T F 3. The scaling stroke that is used to remove calculus from the facial and lingual surfaces of the teeth is the horizontal stroke.

T F 4. The first phase of the scaling stroke is the positioning phase.

T F 5. Prior to beginning the scaling stroke you should establish a finger rest on a soft-tissue structure.

T F 6. In the first phase of the scaling stroke, you should insert the curette under the gingival margin, and keeping the curettes's tip against the tooth surface, move it down until you feel the tension of the soft tissue attachment.

T F 7. Prior to beginning the working phase of the stroke, position the instrument blade so that it forms a 45° to 90° angle with the tooth.

T F 8. You should attempt to use independent finger movement when scaling to avoid becoming fatigued.

T F 9. Your working stroke should be short, controlled, decisive, and directed in a

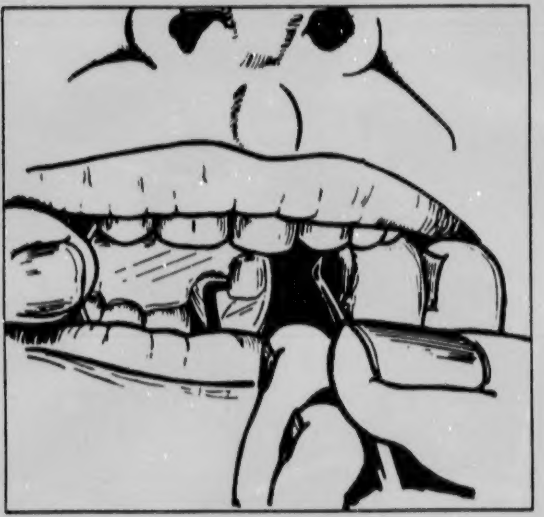


Figure 1-12. Maxillary left posterior, lingual position

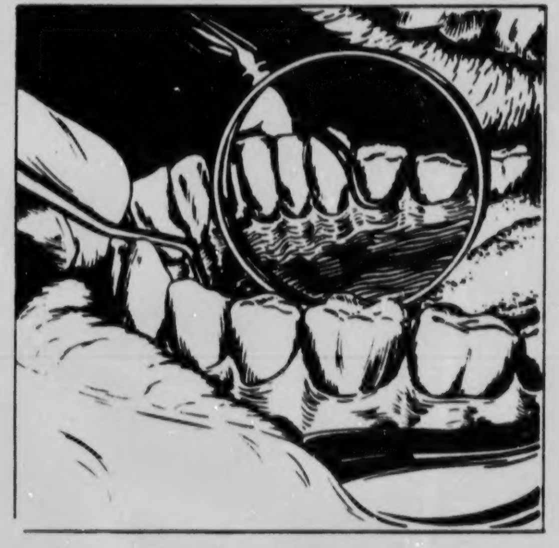


Figure 1-14. Mandibular left posterior, lingual position

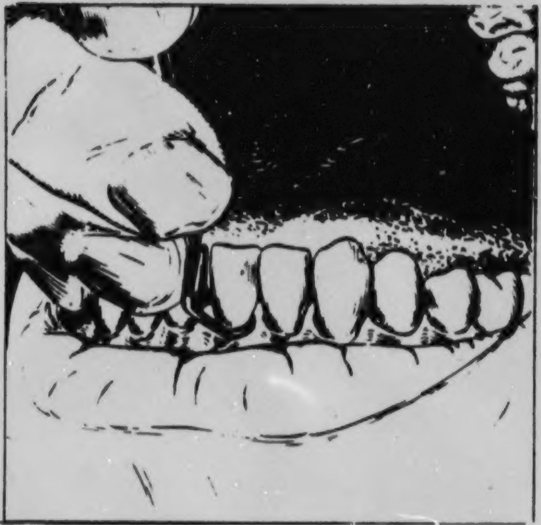


Figure 1-15. Mandibular anterior, facial and proximal position.

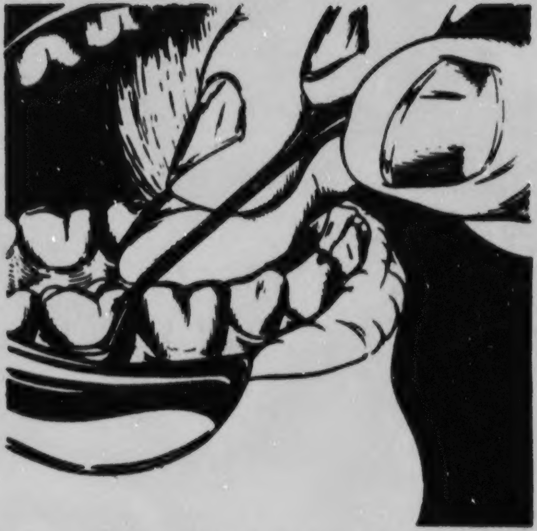


Figure 1-17. Mandibular right posterior, facial and proximal position.

manner to protect the tissues from trauma.

T F 10. During the working stroke, you should slightly increase the pressure on the fulcrum to balance the pressure of the instrument on the tooth being scaled.

T F 11. When you scale the teeth, you should make an effort to reduce the number of times the instrument must be passed over the neck of the tooth.

T F 12. The best method for eliminating calculus involves shaving if off layer by layer.

614. State the reasons for polishing the teeth, and answer key questions concerning the materials and procedures involved in the polishing effort.

Polishing Teeth. After you have completed the scaling procedures, you must polish the teeth. The purpose of polishing is to remove stains and plaque, and to smooth the enamel. Remove gross deposits of stain with hand instruments. Zircate or some other fine abrasive agent is best for polishing. Zircate is mixed with 3 percent hydrogen peroxide or is mixed with stannous fluoride, as we will discuss later in this section. Studies using the electron microscope have shown that the enamel of teeth polished with zircate is much smoother than

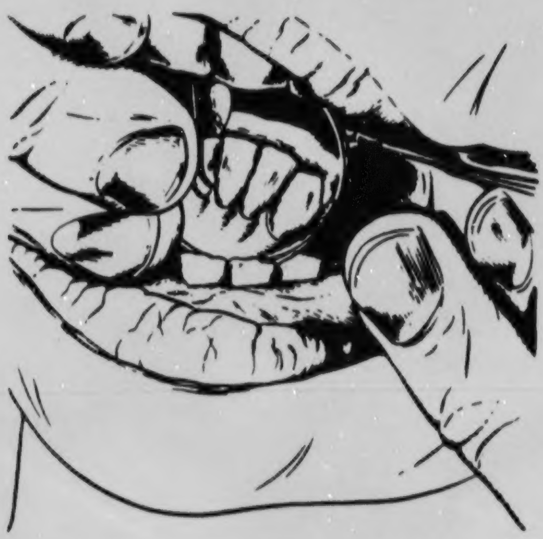


Figure 1-16. Mandibular anterior, lingual position.

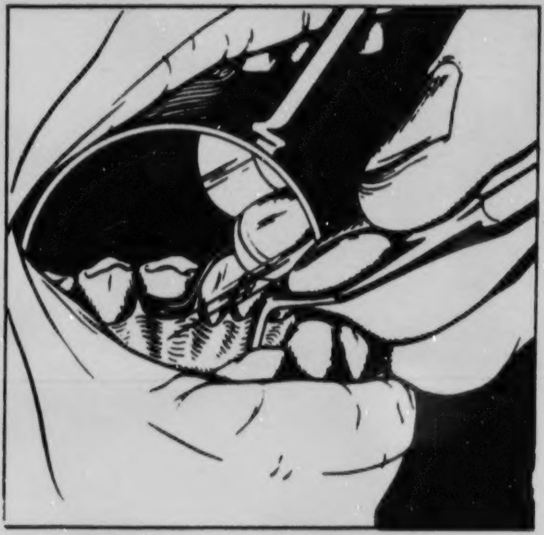


Figure 1-18. Mandibular right posterior, lingual position.

that of teeth polished with flour of pumice. The secondary cuticle (a factor in the formation and attachment of plaque and calculus) does not reattach as fast when the teeth are polished with zircate.

Apply the polishing agent to the teeth with a rubber cup attached to a prophylaxis handpiece or to a conventional speed contra-angle handpiece. You may use a mounted bristle brush on the occlusal surfaces. Use slow speed and light pressure to reduce the amount of heat generated. Be careful not to damage the soft tissues. Keep the cup moving over the tooth surfaces to reduce heat. Use a systematic routine to assure that all areas are polished.

The rotation of the cup or brush can sling polishing material out of the patient's mouth. For this reason, you should wear protective glasses and mask and the patient should be adequately draped to protect his clothing.

You may not be able to reach all of the interproximal areas with the polishing cup. To polish these areas, place zircate in the facial and lingual embrasures and carry it into the interproximal space with waxed dental floss or dental tape. Waxed dental floss or tape is used for this procedure since the chemical and abrasive agents in zircate will rapidly break down the fibers in unwaxed floss. The patient should be informed of this, and instructed to use unwaxed floss for his home care. Unwaxed floss does not leave an undesirable wax residue on the tooth surfaces and generally does a better job since its fibers can spread and cover more of the tooth's surface. Remember that the primary purpose of polishing is to produce a smooth surface. Plaque and calculus do not form as quickly on smooth polished tooth surfaces; therefore, it is essential that all surfaces be polished.

Polish amalgam restorations with a rubber polishing cup filled with zircate or tin oxide. Run the handpiece slowly, using light pressure. If you discover an overhanging restoration, be sure to call it to the attention of a dental officer or make a note of this finding in the remarks section of the patient's dental record. Overhanging restorations are a prime source of gingival irritation, and they should be promptly corrected.

Exercises (614):

1. State the purpose of polishing the teeth.

2. What should you use to remove gross deposits of stain?

3. Name two agents that may be mixed with zircate to make the polishing paste.

4. What is used to apply the polishing agent to the teeth?

5. List three things you should do to reduce the heat generated during the polishing procedure.

6. Why should you wear protective glasses when polishing a patient's teeth?

7. What type of dental floss should you use in conjunction with zircate to polish the proximal tooth surfaces?

8. Why should you recommend unwaxed floss for the patient's home care program?

9. What should you do if you notice an overhanging restoration when you are polishing the teeth? Why?

615. Supply the necessary word or words to complete pertinent statements concerning the preparation and topical application of stannous fluoride.

Topical Anticariogenic Agents. After you complete the scaling and polishing procedure, you should administer a topical application of an approved anticariogenic agent to the teeth. The use of topical stannous fluoride for the Air Force Preventive Dentistry Program is currently recommended in a 30-second application of a 10-percent aqueous solution as the preferred method. The 30-second method described below involves a meticulous procedure.

Prepare the application in the following manner: Dissolve 100 g SnF_2 (stannous fluoride) in approximately 300-ml distilled water in a 500-ml volumetric flask. Add 50-ml glycerin and mix well. Bring flask to volume with distilled water and add 1 ml flavoring oil, such as oil of peppermint, oil of spearmint, oil of anise, or oil of orange. Mix well.

Allow to stand at room temperature for 2 to 3 hours and decant any excess oil. Store in tightly sealed plastic bottle. The identification legend for the bottle should be: "Stannous Fluoride—20 percent stock solution." Date. The prescription legend should be: "For use in dental clinic under professional supervision. Not to be dispensed to patient for self-use."

The following directions are for use of the topical application via the prophylaxis paste. Thorough prophylaxis must precede topical application. Mix stock solution with zirconium silicate (zircate) to prepare fresh prophylaxis paste. A fluid, slurry mix will yield the highest percentage of stannous fluoride, and a thick paste will yield the lowest percentage of stannous fluoride. Other abrasives, such as flour pumice, may be used to deliver stannous fluoride to the dentition.

For topical application in aqueous solution, dilute a small portion of stock solution with an equal volume of distilled water in a dappen dish to provide a 10-percent solution. Isolate the teeth with cotton rolls, dry the teeth with compressed air, and keep the teeth moist with the 10-percent solution throughout a 30-second period. Advise the patient not to eat, drink, or rinse his mouth for 30 minutes following treatment. Repeated applications are recommended at 6- to 12-month intervals. CAUTION: Do not apply fluoride if the patient's gingiva is extremely irritated. Reschedule such patients so that you can evaluate the therapy. If healing is satisfactory at the time of the evaluation, you should then apply the fluoride.

Exercises (615):

1. The amount of fluoride needed to mix a 20-percent stock solution of fluoride in a 500-ml volumetric flask is ______ ______.
2. Oil of peppermint, spearmint, anise, or orange is added to the fluoride mixture to serve as a ________ oil.
3. A freshly mixed fluoride solution should be allowed to stand at room temperature for ____ to ____ hours; then decant any excess oils.
4. The prescription legend on the 20-percent stock solution of stannous fluoride should read: "For use in the dental clinic under ________ ________ Not to be dispensed to patient for ________
5. Topical applications of fluoride must be preceded by a thorough ________
6. A fluid, slurry mix of stannous fluoride and zircate will yield the ______ percentage of fluoride.
7. To prepare for a topical application of fluoride in an aqueous solution, you should dilute the 20-percent solution with an ____ volume of ______ ______
8. The application of SnF_2 in aqueous solution is done by isolating and drying the teeth and then moistening them with the fluoride solution for ____ ______
9. Patients should be advised not to ______, ________ or ______ ______ ______ for 30 minutes after the application of the fluoride solution.
10. Repeated applications of fluoride are recommended at ____ to ______ month intervals.

1-6. Preventive Dentistry Counseling

The preventive dentistry counseling is one of your most important duties, as its impact can motivate the patient to improve oral hygiene. In performing these counselings, you will be amazed to learn the misconceptions many people have concerning oral health. These misconceptions are normally formed because the patients have not previously received the good, sound, professional advice that you can provide. Instead they have been influenced by misleading advertising and the unprofessional oral health training they received from their parents. It is your job to correct such misconceptions and further educate your patients into an adequate oral health program.

616. Identify factors necessary in creating a good counseling atmosphere by matching the factors to their beneficial impact.

The Counseling Atmosphere. The atmosphere you create for your counseling session is of vital importance to the success of the counseling. Position yourself so that you can look the patient in the eye and observe his responses to the various portions of your counseling. You may have to repeat or further clarify points if the patient's responses show that he does not understand or believe what you have said. In most cases, sitting on the operating stool and facing the patient provides a good counseling position. This position allows you to view the patient's facial expression. Additionally, being at the same eye level as the patient helps to establish rapport, since you are not talking down to him like a ruling monarch.

Talk directly to your patient. If you stare at the wall, desk, or some other inanimate object during your counseling, the patient will get the impression that you are not sincerely interested in him. Use simple words, and explain any complex scientific or technical terms with which the patient may not be familiar. After all, your patient probably doesn't know that "gingiva" is the technical term for "gums," and he probably thinks calculus is a form of mathematics. You cannot motivate a person to improve his oral health if you talk in terms he doesn't understand.

Another important aspect in establishing the proper counseling atmosphere is explaining, or better yet, showing and explaining why good oral health care is needed. The phase microscope is of great benefit in convincing the patient that he needs a good oral health program by showing him live microorganisms. Additionally, charts and literature that pictorially illustrate the progression of caries and periodontal diseases are also fine motivational tools. Don't forget the disclosing tablets as they can have the greatest impact on the patient. By using these tablets prior to your counseling session you can actually show the patient the areas his cleansing techniques are missing. Again we repeat a point previously mentioned—your job is not to chastise the patient for his past neglect but to educate and encourage him to improve his oral hygiene.

Exercises (616):

Complete the following exercises by matching the beneficial impact listed in column B to the appropriate factor in column A.

Column A

___ 1. Disclosing tablets.
___ 2. Talking in simple terms.
___ 3. Pictorial charts and literature.
___ 4. The phase microscope.
___ 5. Sitting at the same eye level as the patient.

Column B

a. Allows you to determine if the patient understands your counseling efforts and helps establish rapport.
b. Helps your motivation efforts by allowing the patient to understand your counseling.
c. Convinces the patient he needs an oral health program by showing him live microorganisms from his own mouth.
d. Provides insight to the patient on how dental diseases progress.
e. Actually shows the patient where his cleansing techniques are missing.

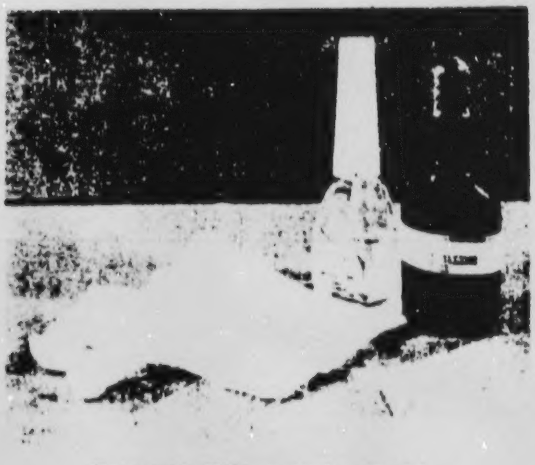


Figure 1-19. Slide preparation materials.

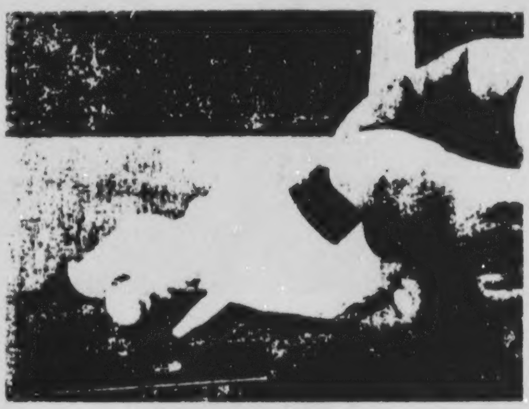


Figure 1-20. Placing saline on the slide.

617. State the purpose of the phase microscope, and describe the preparation procedures for viewing specimens.

Use of the Phase Microscope. Are your verbal powers of persuasion good? Can you tell a patient about bacteria and convince him that what you say is true just because you say it is true? You have already learned that the use of training aids in teaching is a most desirable method of imparting information. Perhaps the best training aid you can use is a microscopic slide. (Naturally, you need a microscope to view the slide.) A slide can show the patient exactly what is living in *his* mouth!

Thinking as a "nonscientist," we can say that the way the phase microscope makes it possible to see colorless, live bacteria is by using changes in the intensity of light. As the light goes through the bacteria, the phase of the light waves is altered. The optical design of the phase microscope converts the phase variations into visible changes in light intensity and permits one to see the outline of the microorganisms clearly. Recently, phase microscopes have been taken out of the luxury price range; scientists have found less costly ways to incorporate the phase principle into the microscope. In the phase microscope, the specimen requires almost no special preparation for use. The phase microscope makes the details of the specimen visible by "optical staining."

Slide preparation materials. To prepare a slide for a patient to view, you must have certain materials. Normally, the sterile pack or the required number of sterile packs is made up in advance. You need the following items:

a. Glass slide on which to put the specimen.

b. Glass side coverslip to put over the specimen so that it is isolated from other organisms and so that it can be seen.

c. Solution to put the specimen in. Use one drop of a solution akin to what is found in the mouth—a normal saline solution.

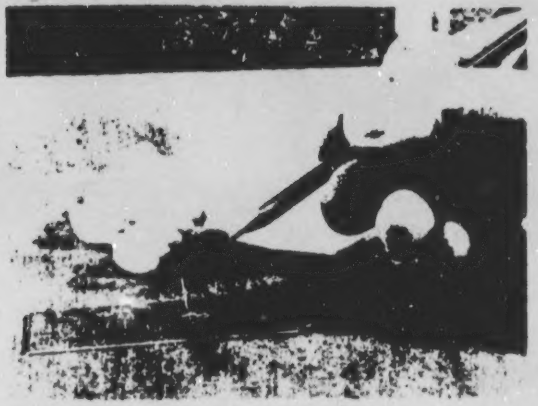


Figure 1-21. Breaking up the scraping.

d. Sterile instrument or dental floss to take the specimen from the mouth.

e. Cotton roll to use to press down the slide cover over the specimen.

f. Gauze sponge to blot excess solution from around the slide.

g. Coverslip cement to seal the slide so the smear will be isolated. (A clear fingernail lacquer will do.)

Preparing for the smear. Prior to obtaining a specimen from the patient's mouth you should lay out the materials you will need to fix the smear. These preparations should be made as follows:

a. Open the sterile wrap.

b. Place the contents at the upper right corner of the wrap. Left-handed persons use the left side.

c. Remove the glass slide and the glass coverslip from the gauze wrapping. Place the slide in the center of the opened wrapper and put the coverslip beside it.

d. Arrange the bottles of saline and slide cement or lacquer as shown in figure 1-19 if you are right-handed or at the left side if you are left-handed.

Preparing the smear. Now you are ready to get a specimen from each patient's mouth. Look for a red area in the mouth and take the scrapings from the sulcus area to get anaerobic bacteria. Place the instrument on the wrapper carefully so as not to dislodge the scrapings. The instrument may be "propped" on the cotton roll. Fix the smear as follows:

a. Place a small drop of saline on the center of the glass slide, as shown in figure 1-20.

b. Pick up the instrument with the smear on it.

c. Immerse the tip of the instrument in saline drop, break up scraping, and let it float free (see fig. 1-21).

d. Grasp the cover glass with the thumb and index finger in vertical position.

e. Touch the bottom edge of the coverslip at the right side of the drop (or the left side, if left-handed). Figure 1-22 shows the coverslip as it makes contact with the glass slide.

f. Gently lower the coverslip over the drop of saline until it makes contact.

g. Let the coverslip fall on the drop of saline and press it gently down against the drop with the cotton rolls. In figure 1-23 two cotton rolls are being used to press the coverslip against the slide.

h. Blot the excess solution from around the coverslip with a cotton roll or gauze sponge.

i. Hold the coverslip as shown in figure 1-24 and seal it with lacquer on all four sides.

Viewing the smear. Now that the slide is prepared, it must be mounted in the microscope for viewing. Since many brands of phase microscopes are used throughout the Air Force, it would be too lengthy to provide mounting instructions for each brand. You should follow the manufacturer's instructions for the microscope used in your particular clinic. Figure 1-25 illustrates the Unitron microscope, which is used in many clinics. The patient does not need to know all the details of the microscope to view his smear. You should focus the microscope for normal viewing and then *show the patient how to operate the fine-tuning adjustment so* he can focus it to his eyes. Most patients will be amazed at the quantity of bacteria that have been living in their mouths. Experiencing this sight will normally make a patient more receptive of your counseling efforts.

Exercises (617):

1. What purpose does the phase microscope serve during a preventive dentistry counseling?

2. List the items needed for slide preparation.

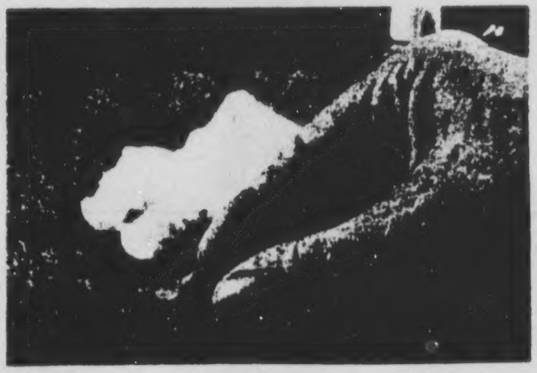


Figure 1-22. Positioning the coverslip.

Figure 1-23. Pressing the coverslip against the slide.

3. Which area of the mouth will yield a specimen of anaerobic bacteria?

4. Briefly outline the steps required for preparing the smear.

5. What should you show the patient concerning the operation of the microscope?

618. Identify subjects that should be discussed during a preventive dentistry counseling.

Oral Health Education. Preventive dentistry counseling and/or oral health education is dependent upon achieving the patient's participation and cooperation. To accomplish this, not only must you provide patients with the knowledge of what they can do to prevent oral disease, but you must also impress upon them the importance of doing it. In these preventive dentistry counselings, stress the following by using simple words the patient will understand:

a. Prevalence of bacteria. Explain that microorganisms are ever present in our environment and that all people are continually infested with them from shortly after birth throughout life.

b. Microorganisms and dental health. Explain that there is overwhelming evidence that microorganisms play a definite role in tooth decay and periodontal disease.

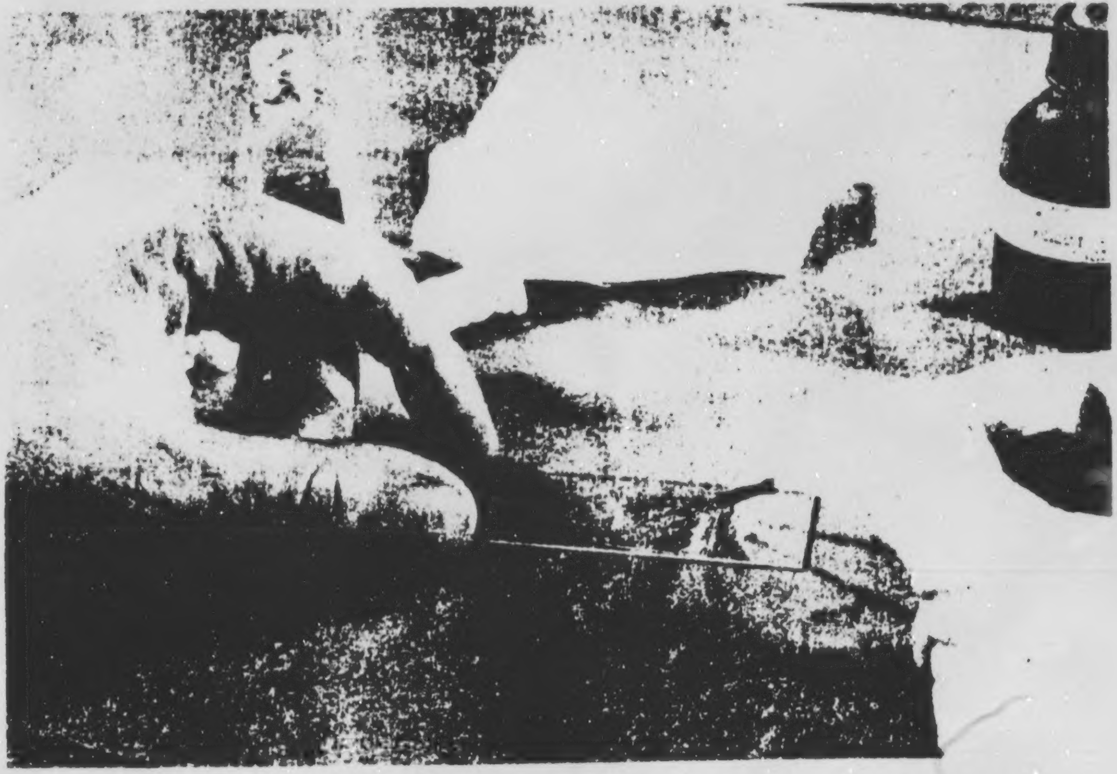


Figure 1-24. Sealing the coverslip.

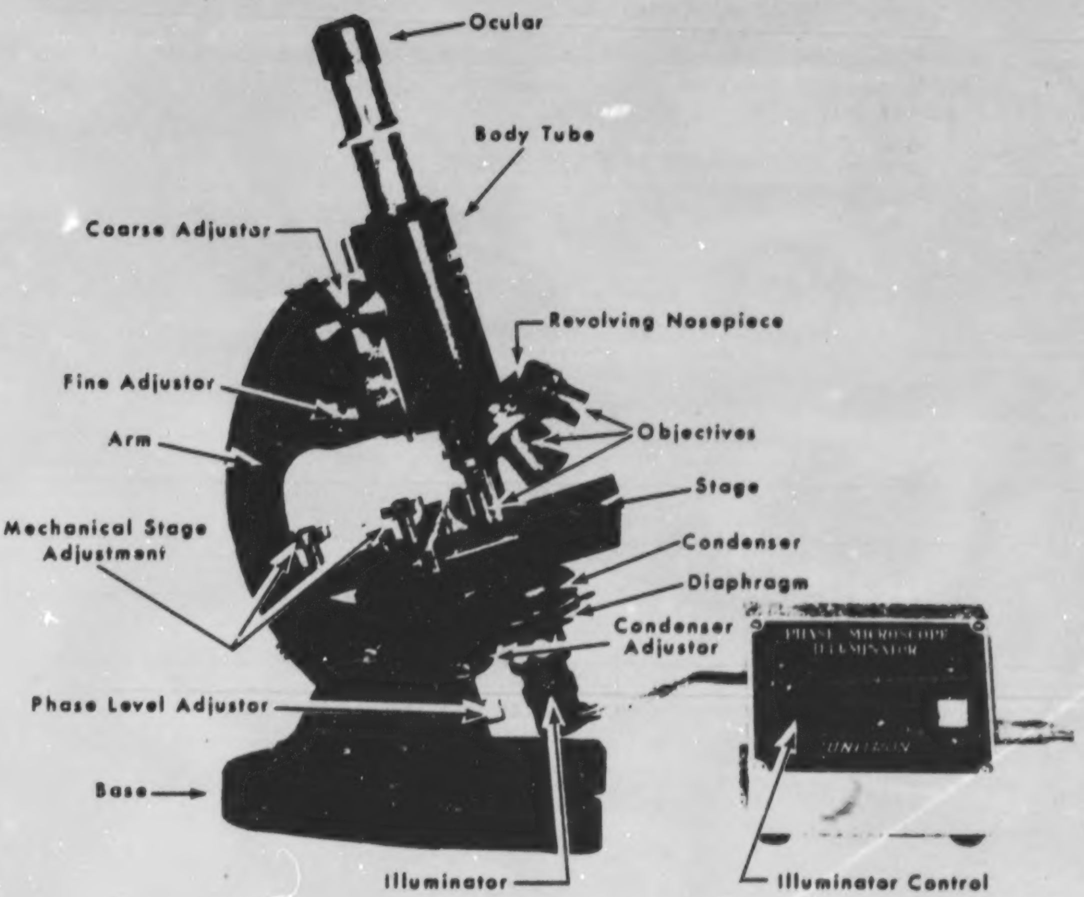

Ocular
Body Tube
Coarse Adjustor
Revolving Nosepiece
Fine Adjustor
Objectives
Arm
Stage
Mechanical Stage Adjustment
Condenser
Diaphragm
Condenser Adjustor
PHASE MICROSCOPE ILLUMINATOR
UNITRON
Phase Level Adjustor
Base
Illuminator
Illuminator Control

Figure 1-25. A phase microscope.

c. Home care. Emphasize to each patient that he can help himself by exercising proper care at home. Explain that this includes the thorough removal of all bacterial plaque at least once every 24 hours and eating a suitable diet. (Show *what* is to be used and *how* it is to be used to cleanse the mouth.)

d. Recommended items for proper home care. Urge the use of a small multituft brush with soft or medium bristles; urge the use of unwaxed dental floss or tape; and if the patient desires to use a dentifrice (toothpaste or powder), suggest he use one which contains fluoride. (Avoid recommending brand names.)

e. Professional care. Leave no doubt in the patient's mind that while proper home care is a must in maintaining dental health, it does not guarantee exemption from dental disease. For this reason, regular (at least annual) professional care is also a necessity.

An ideal time to have this discussion with the patient is prior to the oral prophylaxis—after he has chewed a disclosing tablet and you have pointed out stained areas of the mouth. You have already gained most of the knowledge needed to give a preventive dentistry counseling; however, you should establish a close contact with your local preventive dentistry section to stay abreast of the latest recommended brushing and flossing techniques.

Exercise (618):

1. Identify the subjects that should be routinely discussed with patients during preventive dentistry counselings by placing a checkmark in the spaces provided:

    ____ a. Dental therapeutics.
    ____ b. Need for professional care.
    ____ c. The proper home care program.

323

____ d. Recommended brand name items for the home care program.

____ e. The role microorganisms play in dental disease.

____ f. The proper use of items required in the home care program.

____ g. The prevalence of bacteria.

____ h. Slide preparation for the phase microscope.

____ i. The requirement for, and the diet needed for, adequate nutrition.

330

324

Dental Radiology

THE X-RAY was discovered by Wilhelm Konrad Roentgen in November 1895 in Wurzburg, Bavaria. The use of X-rays in the field of dentistry was first advocated by Dr. Edmund Kells in 1896. Since then the use of X-rays in dentistry has gradually increased until an X-ray examination now plays a prominent part in most diagnoses of dental disorders. This, naturally, demands much of you in the field of radiography.

2-1. Radiology Principles

Quality radiographs must be produced consistently for the dental officer to have the best diagnostic film possible. You must have a thorough understanding of the principles of radiology to perform the various X-ray exposure examination techniques accurately and carefully. Additionally, since X-radiation can be dangerous, it is important that a good diagnostic radiograph be produced each time to avoid unnecessary (additional) exposure of the patient.

619. State various ways in which radiographs are employed in the practice of dentistry.

Use of Dental Radiographs. Radiographs play an important role in diagnosing dental ailments. The radiograph allows the dental officer to view areas of the teeth and the surrounding structure that cannot be seen in a mouth mirror and explorer examination. Through the use of radiographs the dental officer can both diagnose caries and determine how far they have progressed. Cysts, abscesses, and impacted teeth can also be identified on radiographs. Periodontal disease involving bone loss can be seen, and the progression of this disease can be closely followed. Radiographs also are used as a preoperative or postoperative record.

In some treatment areas, radiographs are used as a treatment aid. For instance, in the endodontic section the dentist often requests radiographs to help him determine if he has reamed and filed the root canal to the proper length. Additionally, he normally requests a postoperative radiograph to assure that he has properly filled the root canal. In oral surgery radiographs are sometimes used to indicate the location of root tips that have fractured off during an extraction procedure. They also may be used to verify the complete removal of such root tips.

Exercises (619):

1. What oral areas may dental officers employ X-rays to view?

2. How may a dental officer employ radiographs to aid himself in cases involving periodontal disease?

3. How may the dental officer employ radiographs in the endodontic section as a treatment aid?

4. How may the oral surgeon use radiographs as a treatment aid?

620. Given a list of statements that relate to the various properties of X-rays, match them to the appropriate property.

Properties of X-Rays. The exact nature of X-rays is not totally known. X-rays are thought to be discrete units of energy called quanta or photons. They travel with a wave motion similar to light or radio waves and at about the same speed (186,000 miles per second). The wavelength of X-ray, however, is extremely short, as it is only about one ten-thousandth that of visible light. In units that you can visualize easier, the X-ray wavelength is appoximately one-billionth of an inch. It is this extremely short wavelength that enables X-rays to penetrate many substances. Let's discuss this

331

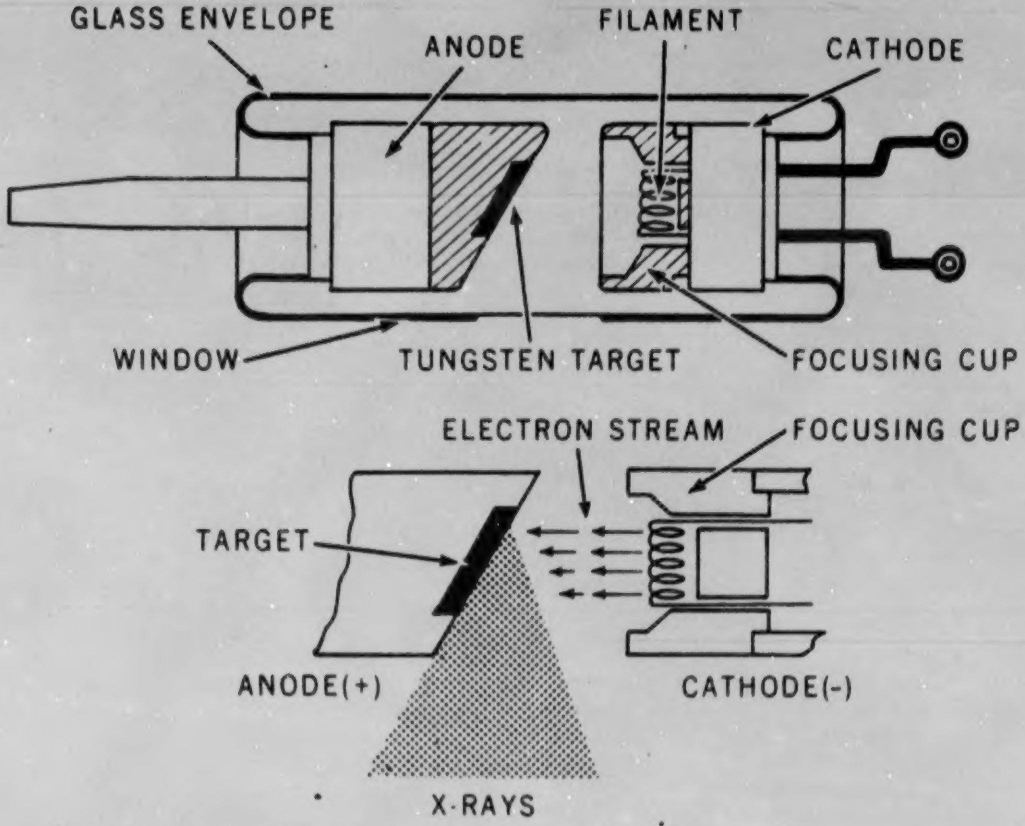


Figure 2-1. Production of X-rays.

penetrating effect plus a few more of the effects of X-rays.

Penetrating effects. When X-rays pass through different substances, they penetrate in varying amounts and degrees, depending upon the wavelength of X-ray employed, the density of the substance being radiated, and the distance from the target to the substance. Scientists have found that the penetrating quality of X-ray will vary inversely with the wavelength—*the shorter the wavelength, the greater the degree of penetration.*

Photographic effects. When X-rays are allowed to fall on a photographic film, the film chemicals will be changed. Upon developing, the film will appear in varying shades of gray, depending upon the amount of X-rays reaching it. Since X-rays travel in straight diverging lines, they can be used to record the densities of various parts of the human body on a photographic film in the form of a shadow picture or a radiograph. These densities are frequently varied due to pathosis, and therefore, some pathological conditions can be detected with the aid of the radiograph.

Fluorescent effects. When X-rays are allowed to fall on certain chemical crystals, such as calcium tungstate, the X-rays are changed to light waves of the visible spectrum, and the crystals are said to fluoresce. This property is used in diagnostic work to give a rapid X-ray examination with the use of a photographic plate. The degree of fluorescence is dependent upon the amount of X-rays striking the crystals. This is the principle used in the fluoroscopic apparatus.

Biological effects. Living cells are sometimes destroyed when subjected to X-radiation. This biological effect may be employed to destroy undesirable cell growths in the human body; for example, cancer. X-radiation is also used in the treatment of certain skin diseases. Germ cells may also be altered, which can cause birth defects. This fact is the main concern in safety practices in using X-radiation.

Ionization effects. When X-rays pass through air or matter, ionization takes place. Ionization means the atoms are altered to become either negatively or positively charged. This property enables experts to measure the quantity of radiation produced by measuring the ionization (electrical charge) of the air through which the radiation passes.

Exercises (620):

Identify the properties of X-rays by matching the items in column B to the appropriate term in column A.

Column A

___ 1. Speed of X-rays.
___ 2. Fluroescent effect.
___ 3. Biological effect.
___ 4. Penetrating effect.
___ 5. Photographic effect.
___ 6. Ionization effect.

Column B

a. The special effect X-rays have on certain chemical crystals, such as calcium tungstate.
b. The property that enables experts to measure the quantity of radiation.
c. The degree of this effect is determined by the wavelength of the X-rays.
d. About the same as that of visible light.
e. The effect X-rays have on radiographic film.
f. The main concern for safety practices when using X-radiation.

621. Name the components of the X-ray tube, and by answering a series of key questions, tell how they function to produce X-rays.

Production of X-Rays. The production of X-rays occurs when high-speed electrons strike matter. In order to effectively produce X-rays, an electric current of high voltage must be applied and passed through the X-ray tube. The tube consists of two terminals, one positive and one negative. The cathode or negative terminal has two principal parts: (1) a tungsten filament, around which is placed a (2) molybdenum cup that focuses the cathode rays on the anode. The anode or positive terminal has three parts: (1) the tungsten target upon which is located the focal spot where the cathode rays are directed, (2) a copper head into which the tungsten target is set, and (3) a copper stem that extends to the outer end of the anode arm. The copper head and stem serve to dissipate the heat created during X-ray production. These components are encased in a glass envelope, which forms the outer shell of the X-ray tube. (See fig. 2-1.) The tube itself is located inside the X-ray tube head. In addition to containing the X-ray tube, the tube head also contains an oil or a gas that serves as an insulator for the heat created during X-ray production.

Although the production of X-rays is as rapid a process as turning on a table lamp, there are two independent actions that occur. First, low voltage current heats the tungsten filament of the cathode terminal to incandescence; as this occurs, a cloud of electrons forms around the tungsten filament. Next, high-potential (voltage) current is passed through the X-ray tube. This propels the electrons toward the tungsten target at a very high rate of speed.

During this transition from cathode to anode, high speed and kinetic energy are imparted to the electrons. Upon reaching the anode, the electrons are suddenly stopped as they impact against the tungsten target. During the stopping period, the electrons must give up the kinetic energy. The energy reappears, or is converted to X-rays and heat. The bulk of the energy liberated at the anode is heat, with the remainder (about 1 percent) appearing as X-rays. The tungsten target is set in the copper head at an angle that directs the X-rays out the glass window of the X-ray tube.

To permit maximum acceleration of the electrons, the glass enclosure of the X-ray tube is under a high degree of vacuum. If a good vacuum is not present, unwanted atoms and electrons move around within the glass tubing. This will cause sparking; a gas discharge will take place inside the tube when current is passed through it, and few, if any, X-rays will be produced.

The electron stream across the X-ray tube constitutes the tube current. This current, which is small in magnitude, is generally expressed in milliamperes (mA). One milliampere is 1/1000 ampere. Currents upward to 1,000 mA are used with modern X-ray tubes. The voltage across the anode and cathode is relatively high and is measured in kilovolts (kV). One kilovolt is 1,000 volts.

The X-ray wavelength of the emitted radiation varies from a certain minimum to very long. The wavelength is governed by the amount of voltage applied to the X-ray tube. X-rays produced by low voltage are of longer wavelength and have low penetration. They are often referred to as soft radiation. X-rays produced by high voltage are of shorter wavelength and, therefore, have high penetration power. These rays are referred to as hard radiation.

Exercises (621):

1. Name the two terminals of the X-ray tube.

2. Name the parts of the X-ray tube's positive terminal.

3. Name the parts of the X-ray tube's negative terminal.

4. When does a cloud of electrons form around the tungsten filament?

5. When are the electrons propelled toward the tungsten target at a high rate of speed?

6. What occurs as the electrons impact upon the tungsten target?

7. What condition inside the X-ray tube permits the maximum acceleration of electrons?

8. What current is measured in kilovolts?

9. Describe the X-rays produced by high voltage.

622. Given a series of statements concerning the hazards and types of X-radiation, determine which are true and which are false.

Hazards of Radiation. The most important consideration in the field of dental radiography is adequate protection for the operator and patient from the hazards of radiation. X-radiation is an invisible, odorless, and soundless form of energy that can inflict injury and death to body tissues if the proper precautions are not observed. While we would exercise expeditious action to remove ourselves from the path of a speeding locomotive, this self-protective instinct is not always observed with X-radiation. Since X-rays are not apparent to the senses, inexperienced technicians have a tendency to overlook their potential hazard. This tendency is extremely dangerous, since X-rays possess the same potential hazard as that speeding locomotive. X-rays, if improperly used, can severely and irreparably damage vital body organs, cause genetic mutations, and result in the loss of human life. Many of the early pioneers of radiography lost their lives learning the hazards of X-rays. Some modern day radiologists and technicians have lost their limbs or their lives because they were irresponsible and didn't bother to follow the proper safety practices. Carelessness and indifference on the part of the technician is the most common cause of overexposure to X-rays.

In the *average* dental radiographic examination, the amount of radiation received by the patient is quite small and only a fraction of the harmful dose. The effects of radiation are, however, *cumulative*. This cumulative effect of X-rays can be extremely harmful. For example, there is a certain amount of cellular change in tissues and organs exposed to even safe quantities of radiation. As long as the body is functioning properly, most cells will regenerate themselves and become normal again. This regeneration does, however, take time, and if another dose of radiation is applied shortly after the first dose, more cellular change (cumulative) will occur. If this additional cellular change is great enough to impair the function of the organ or tissue, repair or regeneration may not be possible. Though the cumulative effects present a danger to the patient, they probably present a greater danger to the technician because he spends day after day in the exposure room. It is always wise, however, to question the patient and find out if he has recently been exposed to any type of radiation about the head and neck area. If quite a few exposures have been made within the preceding 30-day period, it would be best to consult the dental officer before proceeding with any further dental X-ray exposures. For you to understand the need for proper safeguards against radiation, it is necessary that you understand the types of radiation produced by the X-ray equipment and the factors that influence the dose. The types of radiation produced during a radiographic examination are:

(1) *Primary radiation.* This radiation is the useful beam; it comes directly from the focal spot on the anode target of the X-ray tube.

(2) *Indirect radiation.* This is radiation coming from parts of the X-ray machine other than the focal spot. It may come from the tube housing and head assembly of the machine. It is sometimes referred to as leakage radiation.

(3) *Secondary radiation.* This is radiation emitted by any substance through which X-rays are passing. It consists of longer wavelengths coming from the X-ray tube and housing and from the soft tissues of the area being radiographed. It may sometimes be referred to as a scattered radiation.

Exercises (622):

Identify factors concerning the hazards and types of radiation by circling either the T or F to indicate whether the following statements are true or false.

T F 1. The most important consideration in the field of dental radiography is obtaining high-quality diagnostic radiographs.

T F 2. Massive overdoses of X-ray produce about the same harmful effects as sunburn.

T F 3. Carelessness and indifference on the part of the technician is the most common cause of overexposure to X-rays.

T F 4. Inexperienced technicians have a tendency to overlook the potential hazards of X-rays because the X-rays are not apparent to their senses.

T F 5. The cumulative effects of radiation are important since two normally safe doses of radiation applied within a short time span can together equal a harmful dose.

T F 6. The type of radiation emitted by substances through which X-rays are passing is called indirect radiation.

T F 7. The useful beam is classified as primary radiation.

623. Explain the safety practices and equipment features related to protection from overexposure by X-radiation.

Protection from Overexposure by X-Ray. There are certain safety practices that must be observed by the operator to insure proper protection from overexposure by X-rays. The recommendations for proper protection against all types of radiation should be followed closely. Certain protective measures are built into exposure rooms, such as the adequate shielding of the walls and doors to prevent X-rays from passing through them and exposing personnel in adjacent areas. The safety measures we discuss in this section are those over which the operator has control:

(1) The operator must be in the proper position during exposures. This includes standing away from the tube head, out of the line of the useful beam, and behind an adequately shielded protective barrier.

(2) Personnel working in the dental radiography section must wear a film badge (at chest level). Each film badge is issued by the environmental health section, and each film badge is for use only by the individual in whose name it was issued.

(3) Protective clothing, such as a leaded rubber apron, should be worn by patients receiving multiple exposures.

(4) The X-ray film should be held by the patient or a mechanical film holder while the exposure is being made. The film should *never* be held by the dentist or the technician. A parent or guardian should hold the film for small children who are unable to hold the film in place themselves.

(5) The tube and head assembly of the machine should not be held by hand during exposures.

(6) The door of the exposure room should be closed when radiographs are being exposed. This is done to protect patients and coworkers in areas near the exposure room from unnecessary exposure to radiation.

(7) The number of exposures of a particular patient should be held to a minimum, consistent with the diagnostic requirements. In other words, don't take exposures that are not necessary.

(8) Repeated radiographic exposures using human patients to develop a technique or for practice must be avoided. Commercially available shields, such as the Dexter II, should be used for this purpose.

(9) Care must be exercised in moving the tube head to and from the working area. Avoid striking the tube head against the dental unit, wall, or other structures. Damage to the tube head could result in leakage of radiation.

As mentioned in the preceding paragraphs, the *film badge* must always be worn (at chest level) by personnel working in the radiography section. The badge is worn at chest level to measure whole body radiation. This film badge is part of a radiation monitoring program designed to protect personnel working in certain radiation areas. The badge worn in the dental radiography section contains special films that provide a permanent record of X-radiation received by personnel working there. If you are assigned to the radiography section, be sure to wear the provided film badge because it is for *your* protection.

The film badge consists of a plastic case (usually blue in color), which is slightly larger and thicker than a book of matches. The badge contains one or two film packets that are approximately the size of dental periapical film packets. An alligator-type clip is provided on the back of the film badge. This clip makes it easy for you to attach the film badge to the outer part of your uniform.

Personnel from the environmental health section collect these film packets at predetermined intervals (usually monthly) and forward them to the USAF

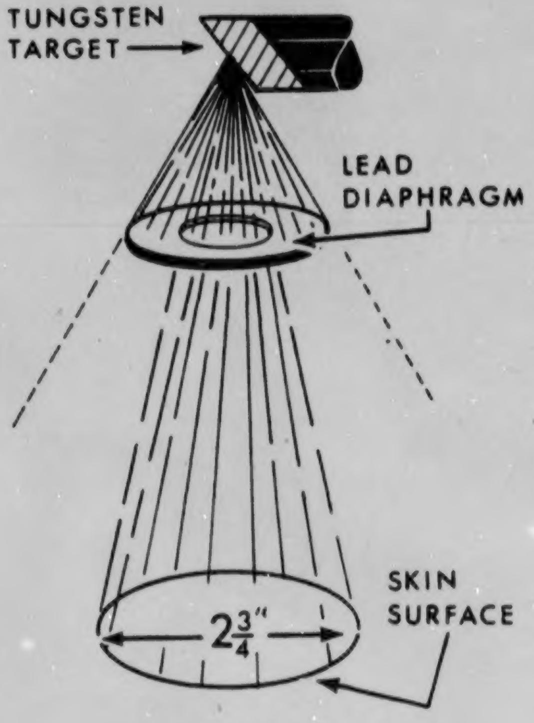


Figure 2-2. Collimation.

Radiological Health Laboratory, Wright-Patterson AFB, Ohio, for evaluation. There, the films are developed under carefully controlled conditions and evaluated. If abnormally high radiation dosages are detected, a message so stating is hurriedly dispatched to the originating environmental health section. Such a message usually triggers a comprehensive investigation. Dosages considered to be normal are recorded and forwarded quarterly.

The film badge should be worn at all times when you are working in the radiography section. You should *not*, however, wear the badge outside the dental clinic. Instead, you should always place your badge in the designated safe-storage area. This is an area located in the dental clinic that is free from exposure to direct sunlight, radiant heat, or other types of radiation. Exposing a film badge to direct sunlight, radiant heat, or other types of radiation could affect the highly sensitive films used in the film badge. Therefore, it is to your advantage to wear and store the film badge as we have indicated. Carelessness on your part may result in a waste of time and expense in an investigation, not to mention possible endangerment to your own health because of an undetected overdose of X-radiation.

In addition to the safety precautions you must observe when exposing radiographs, the manufacturers of modern X-ray equipment provide some built-in safety features. These features offer additional protection by means of filtration and collimation. Although most modern X-ray units are adequately equipped with these built-in devices, often they are removed by technicians who are not familiar with them. Let's discuss filtration and collimation and see how they provide protection.

Filtration. Filtration is an important element in the control of the emerging radiation. Inherent filtration is the amount produced by the X-ray tube enclosure itself and is expressed as an equivalent thickness of aluminum. An additional aluminum disk is usually located where the rays exit the tube head. This is done to increase the total filtration of the useful beam to at least 2.5 mm of aluminum. The inherent filtration along with the aluminum disk serve to absorb poor quality long wavelength radiation, which would normally be absorbed by the patient's soft tissues and which is not of any diagnostic value. Be sure not to remove the aluminum filter as it serves to protect the patient from useless radiation.

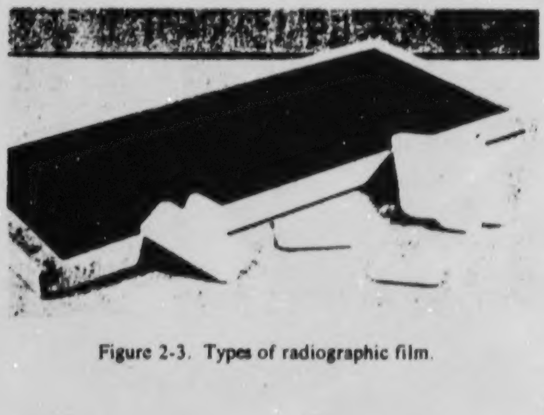


Figure 2-3. Types of radiographic film.

Collimation. Collimation serves to limit the area of exposure on the patient. It is accomplished by use of the lead diaphragm, which is usually located just in front of the aluminum filtration disk. Without this diaphragm, radiation emerging directly from the tube head would expose an area approximately 6 inches in diameter at the patient's skin surface. This must be reduced, by collimation, to an area not more than 2¾ inches. Through collimation, the X-ray beam is restricted to cover only the area of interest. Resultantly, unnecessary exposure to the patient's throat and eye areas is drastically reduced. (See fig. 2-2.) A recently developed lead-lined rectangularly shaped pointer tube is also available to further reduce the area of exposure at the patient's skin surface.

Exercises (623):

1. What safety feature is built into the exposure room?

2. Where should the operator stand during X-ray exposures?

3. What protective clothing should be fitted to patients receiving multiple exposures?

4. When, if ever, is it permissable for the X-ray technician to hold the film in position, for the patient, during an exposure?

5. Why should the door of the X-ray room be closed during exposures?

6. What should be used, in place of human patients, to develop or practice radiographic techniques?

7. Why must you avoid striking the X-ray tube head against the dental unit, walls, or other objects?

8. Why is the X-ray film badge worn at chest level?

9. What action occurs if the USAF Radiological Health Laboratory detects abnormally high radiation dosages on a packet from a film badge?

10. Why shouldn't you wear the film badge outside the dental clinic?

11. How does *filtration* protect the patient from useless radiation?

12. How does *collimation* protect the patient from unnecessary radiation?

2-2. Dental Radiographic Film

Radiographic films are available that have the characteristics needed to produce a diagnostic radiograph. The inherent characteristics of the films include satisfactory speed, desirable contrast, and convenient size. In addition, the films allow sufficient latitude to compensate for small errors made in exposure time and the X-ray absorption of the area being radiographed. The film also permits unavoidable fluctuations in the current to the X-ray machine without affecting the completed radiograph. Because of the various oral structures to be viewed, different types of radiographic film must be used.

624. Name the types of dental X-ray film and state their characteristics.

Types. Radiographic films are made in different sizes to be used in making the two general classes of dental radiographs: intra-oral and extra-oral. Intra-oral radiographs are made by placing the film packets inside the mouth; these require small films. Extra-oral radiographs are made by placing film holders or cassettes adjacent to the head or face and directing the X-rays through the area being radiographed. Larger films are used in making extra-oral radiographs. Refer to figure 2-3 as we discuss the individual film types.

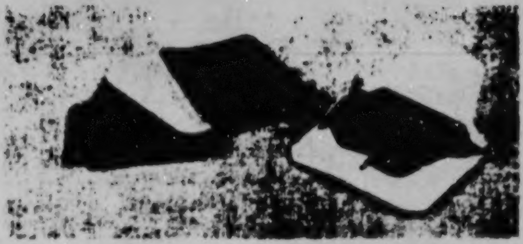


Figure 2-4. Contents of the film packet.

Periapical film. Periapical film is the film most commonly used. It is used to radiograph the crowns, roots, and supporting structures. The periapical X-ray film has an embossed dot on the tube side of the film to permit identification of the lingual aspect of the image. There is a printed dot on the film packet which corresponds with the embossed dot on the film. When you make an exposure, be sure that this printed dot is toward the occlusal or incisal surface of the teeth. This is to insure that the embossed dot is not superimposed over the apical region of the teeth.

Bitewing film. The interproximal, or bitewing, film is used principally to locate cavities on the interproximal surfaces of the teeth. It permits viewing of the crown portion of the tooth and a small area of the root. To hold the film in position, the patient's teeth close on a tab which is attached to the film packet.

Occlusal film. The occlusal film is a larger film that is placed horizontally between the occlusal surfaces of the upper and lower teeth. The occlusal film is occasionally used to obtain a general view of the maxillary or mandibular arch. This type of film is especially useful in aiding the dentist to locate foreign bodies in the floor of the oral cavity and impacted teeth, cysts, etc, in the palate. There are usually two films in the occlusal packet, which allow for different developing times. By using different developing times you can provide the dentist with two different film contrasts: one for hard oral structures and one for soft oral tissues.

Pedodontic film. Pedodontic or "Pedo film," as it is commonly referred to, is a smaller version of the periapical film. It is used to obtain periapical-type radiographs of children or adults with an extremely small mouth.

Extra-oral films. Extra-oral films are used to obtain a panoramic view of the oral structures and to view specific facial bones, sinuses, or the temporomandibular joint. Extra-oral films must be loaded into cassettes prior to use. A cassette is a hinged, lightproof aluminum box that contains two intensifying screens, which fluoresce when exposed to X-rays. The screens light up and produce a more intense exposure of the film without requiring an increase of exposure time. Extra-oral films may be used to supplement the finding of periapical and occlusal radiographs. They are valuable in the diagnosis of dislocations of the mandible, impacted teeth, malignancies, foreign bodies, sinus involvements, and fractures.

General Characteristics. Radiographic film consists of a transparent, cellulose base coated on one or both sides with an emulsion. The emulsion is composed of silver halides in gelatin and is very sensitive to both X-rays and light. When the film is exposed to X-rays, the energy from this exposure is stored in the emulsion. This produces what is called a latent image. However, this image cannot be detected by ordinary physical methods and must be immersed in certain chemicals to produce a visible image. The image becomes visible when the developer solution causes a chemical reaction and transforms the exposed silver halides into a black metallic silver. The amount of silver suspended in the emulsion produces different shades on the processed radiograph. These shades may vary from gray to black. Areas not exposed to X-rays will appear clear.

The various types of film have different speeds. This means that they vary in their sensitivity to X-rays. This sensitivity affects the amount of exposure time and the detail of the completed radiograph. The two speeds of film used by the Air Force are intermediate (medium fast type B) and ultraspeed (super type D). The manufacturers of the different films use their own trade names to identify each speed.

Film used for intra-oral radiographs is supplied in packets of different sizes. The outside of these packets is both lightproof and waterproof. Inside the packet, the film is sandwiched between black protective paper, and this in turn is backed by lead foil. (See fig. 2-4.) The packet is pliable enough to be contoured to the correct position in the mouth, yet firm enough to resist excessive bending that would distort the radiographic image. The lead foil backing in the film packet prevents secondary radiation (which scatters from the oral tissues) from fogging the film.

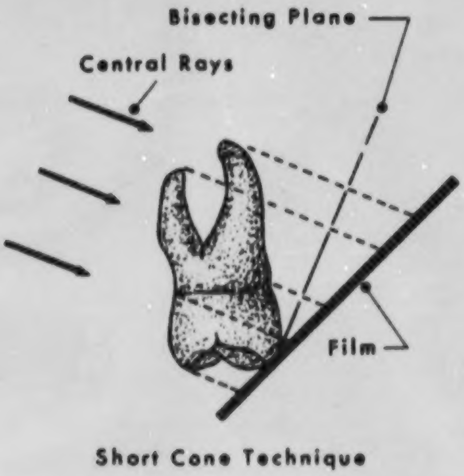


Figure 2-5. Short cone technique.

Unlike intra-oral film, extra-oral film is not packaged in individual lightproof and waterproof packets. Therefore, the individual sheets of film must be removed from the packaging container and loaded into cassettes in the darkroom.

X-ray films must be protected by proper storage. These films must be kept in a cool, dry place, or they will deteriorate rapidly. X-ray film should *never* be kept near steam lines or radiators. An ideal place for the bulk storage of X-ray film is in a refrigerator. Additionally, many chemicals affect films adversely. Therefore, never store the films near areas where drugs are kept, because exposure to the vapors usually present in such places may result in decomposition of the film. Since films are sensitive to X-rays, they must be kept in lead-lined containers if stored in or near the exposure room. When several films are to be exposed, they should be taken one at a time from the dispenser, exposed, and dropped into a lead-lined receptacle. This protects them from being affected by secondary radiation.

Boxes containing extra-oral films should be stored so that the films are standing on edge and not lying flat. This method of storage will prevent them from being pressed together. A minimum film stock should be maintained. The oldest film should be used first so that the film stock will always be fresh and will not exceed the exposure limit date.

Exercises (624):

1. What type of dental X-ray film is most commonly used to view the crowns, roots, and supporting structures of the teeth?

2. How should the embossed dot on the periapical film packet be positioned when you are making an exposure? Why?

3. What type of film is used principally to locate cavities on the interproximal surfaces of the teeth?

4. What type of view is the occlusal film used to obtain?

5. Why are there usually two films in the occlusal film packet?

6. What name applies to the smaller version of the periapical film?

7. What may extra-oral films be employed to view?

8. How do the intensifying screens in a X-ray cassette function?

9. What is used to coat the transparent cellulose base of the X-ray film?

10. What is produced when X-rays strike the film's emulsion?

11. What must be done to make the latent image on the X-ray film visible?

12. What are the two speeds of dental X-ray film stocked by the Air Force?

13. Describe the construction of an intra-oral film packet.

14. What is the purpose of the lead foil backing in the film packet?

15. Why must extra-oral film be removed from the packaging container and loaded into cassettes in the darkroom?

16. Where should X-ray film be stored?

17. In what position should boxes containing extra-oral film be stored?

Figure 2-6. The dental X-ray unit.

2-3. Exposing the Radiographs

There are two techniques for exposing intra-oral radiographs—the long cone technique and the short cone technique. This section discusses both of these techniques plus the techniques used to obtain extra-oral radiographs. Our discussion begins with the short cone technique.

625. State the principle of the short cone radiographic technique and indicate the target-film distance it employs.

Short Cone Technique. The short cone technique is often referred to as the bisecting angle technique. The principle of the short cone technique is to direct the X-ray beam perpendicular to an imaginary plane that bisects the angle formed by the recording plane of the film and the long axis of the tooth. This principle is shown in figure 2-5. As the name implies, when you are using the short cone technique, the short nose cone must be in place on the X-ray tube head. This nose cone serves as a pointer, and its tip is positioned against the patient's skin surface during exposures. Some manufacturers supply a short tube in place of the cone. When properly positioned, the tube head establishes a target-film distance of about 8 inches. This means that the distance between the tungsten target located in the tube head to the film in the patient's mouth should be approximately 8 inches. Maintaining proper target-film distance is important because variations will alter the X-ray unit's collimation and will also change the required exposure time.

Exercises (625):

1. What is the principle of the short cone radiographic technique?

2. What is the target-film distance employed with the short cone technique?

3. How is the proper target-film distance established?

626. Name the unit adjustments needed to produce short cone radiographs, indicate what these adjustments control, and state when the adjustments should be made.

Unit Adjustments. There are a number of steps used in producing radiographs with the short cone technique. Let's begin by adjusting the X-ray unit. You should set the unit adjustments and check its operation prior to patient entry. This machine adjustment includes those items that are checked to insure proper operation of the X-ray unit—kilovoltage, milliamperage, and timer controls. (See fig. 2-6.) As you check your unit, make sure that it is plugged into the electrical outlet, that it is turned on, and that the kilovoltage and milliamperage are at the settings required by the technique. Kilovoltage and milliamperage control the quality and quantity of the radiation.

Kilovoltage. Kilovoltage (KVP) is the pressure that forces the electric current through the circuit much like the pressure in a garden hose. It governs the speed at which the electrons travel between the cathode and anode. This speed determines the impact velocity of the electrons and therefore the wavelength of the resulting radiation. Because the shorter wavelength radiation (as produced by high kilovoltage) has more penetrating power, it is considered to be high-quality radiation.

Milliamperage. Milliamperage (mA) is the amount of electricity that is applied, much like the amount of water carried by a garden hose. With higher milliamperage, more electrons impact upon the tungsten target of the anode. This, of course, governs the quantity of the radiation. Another machine setting that controls the quantity of radiation is the exposure time.

Exposure time. The *timing* of the period during which the X-ray tube emits X-rays is accomplished by special timing and switching circuits. In dental radiography, exposures range from a fraction of a second to several seconds. The timers on some X-ray equipment are calibrated in impulses. These impulses represent fractions of seconds; usually 1 impulse equals one-sixtieth of a second. The modern trend is to reduce exposures to a minimum time. Timers of various types (mechanical, electromechanical, and electronic) are employed for this important function. Follow the instructions for setting kVP, mA, and exposure time as prescribed by the manufacturer of the specific film you are using.

Exercises (626):

1. When should you set the unit adjustments and check its operation?

2. What machine adjustments govern the quantity of radiation produced?

3. What machine adjustment controls the quality of the radiation produced?

4. What guidance should you follow when setting the kVP, mA, and exposure time?

627. Identify the planes of reference and describe the proper patient position for short cone radiographs.

Patient Position. To produce a diagnostic radiograph, you must require the patient to use a fixed head position. In order to achieve the correct head position for the patient, you must be familiar with the three planes of references which are listed below:

- Median sagittal plane: an imaginary vertical line through the center of the body which divides it into right and left halves.
- Ala-tragus line: an imaginary straight line from the ala (or wing) of the nose to the tragus (the lobe in front of the opening of the ear).
- Tragus-corner of the mouth line: an imaginary straight line from the tragus of the ear to the corner of the mouth while the teeth are in a closed position.

For bitewing exposures, and for periapical exposures of the maxillary arch, the patient should be seated so that the *median sagittal plane* is vertical and the *ala-tragus line* is parallel to the floor. For periapical exposures of the mandibular arch, the *median sagittal plane* should be vertical and the *tragus-corner of the mouth line* parallel to the floor. When you position the patient in this way, the occlusal plane of the arch being X-rayed is parallel to the floor when the patient's mouth is open.

Exercises (627):

Identify the planes of references in items 1 thru 3 by matching the description in column B to the correct term in column A.

Column A	*Column B*
___ 1. Tragus-corner of the mouth line.	a. An imaginary line from the wing of the nose to the lobe in front of the ear opening.
___ 2. Median sagittal plane.	b. An imaginary vertical line that divides the body into right and left halves.
___ 3. Ala-tragus line.	c. An imaginary line from the corner of the mouth to the lobe in front of the ear opening.

4. How should the patient be positioned for short cone periapical exposures of the mandibular arch?

5. How should the patient be positioned for short cone bitewing exposures or exposures of the maxillary arch?

628. Answer a series of key questions that serve to describe procedures involved in the placement of dental radiographic film.

Periapical Film Placement. Proper placement of the film packet is necessary if distortion of the images is to be prevented. Because of the variation in the anatomic structure of the patient's mouth, it is often necessary to flex or mold the film packet to make it easier to position. Do not crimp or bend the film sharply as this could crack the film's emulsion or distort the radiographic image. In placing the film packet in the patient's mouth, you must consider several points. Place the film in position. Do not slide it over the mucous membrane into position, since this may cause the patient to gag. Center the packet behind the teeth to be radiographed. The long axis of the film packet should be in the vertical position when radiographing anterior teeth and horizontal when radiographing posterior teeth. Extend the film's edge about one-fourth inch beyond the biting surfaces of the teeth. This insures recording the whole crown on the radiograph and creates a slight border that allows the film to be mounted without obstructing the dentist's view. Prevent movement by retaining the film in position through use of the patient's finger or thumb. Have the patient press the film packet firmly against the teeth being radiographed. The operator must never hold the film in place himself. Before making the exposure, instruct the patient to relax as much as possible without changing the position of the film packet or the patient's head. Relaxation of the patient will prevent movement during the exposure.

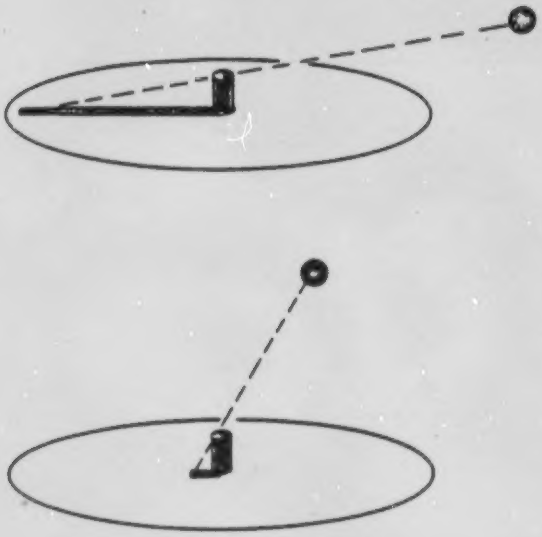


Figure 2-7. Vertical angulation.

There is no way that the finished radiograph will show what you wanted it to show unless you place the film in the correct area of the mouth. You just can't place the film behind the molars to expose the bicuspids. The following teeth should be shown by these individual exposures:

- Molar—shows the second and third molars.
- Bicuspid—shows the first bicuspid, second bicuspid, and the first molar.
- Cuspid—shows the cuspid and the lateral incisor.
- Incisor—shows the central incisors and lateral incisor.

If you place the film correctly, most of the teeth will appear on two different exposures. Don't bend the film excessively because this causes distortion of the image.

Even if you are assigned to the dental radiography section for only a brief period of time, you will undoubtedly encounter a gagging patient. Although such patients can present quite a problem, they need not always cause undue alarm. A few counteractions have proved to be at least partially effective in reducing the severity of the gag reflex. In some cases, counteractions have completely eliminated the tendency to gag. Without suggesting the most or least effective, we offer the following

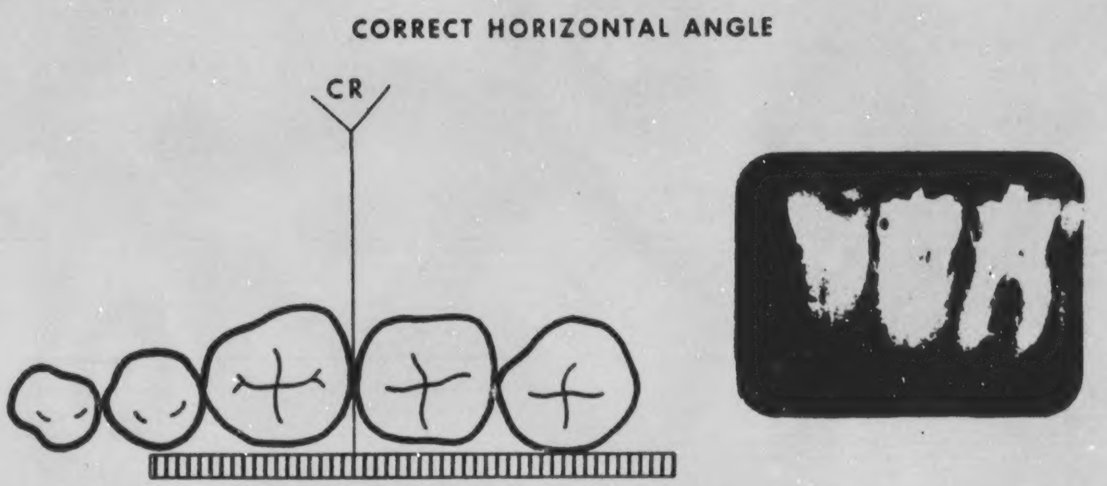


Figure 2-8. Horizontal angulation.

counteractions for your possible use when making radiographs on the gagging patient:

(1) Before you attempt to position the film in the patient's mouth, try coating the patient's uvula and soft palate with a spray-type anesthetic.

(2) Simply ask the patient to breathe through his nose instead of his mouth. You might also ask the patient to hold his breath during the exposure time for each film.

(3) Place an interesting (noncontroversial) painting, photograph, or other object in view of the patient and ask him to concentrate intensively upon the object during film exposures.

(4) Ask the patient to close his eyes and concentrate upon a pleasant subject.

(5) Suggest the patient mentally count backwards by starting at 100.

A gag reflex is a psychological defense mechanism. Do not add to this by telling the patient, "You are a gagger," or "I'll try not to gag you." Just try one of the ideas we have given you above and don't give the patient a suggestion that may trigger his gag reflex.

Bitewing Film Placement. Like the periapical film packet placement the bitewing film packet is also centered behind the teeth being radiographed. As you place the film in the patient's mouth, direct the wing or tab toward the patient's cheeks. Once the film is in position, have the patient bite down firmly on the tab to hold the film in position during the exposure. Caution the patient to keep his teeth closed together until after the exposure has been made.

Exercises (628):

1. Why is it often necessary to mold or flex the film packet?
2. Why shouldn't you bend the film packet sharply?
3. Why is it important to place rather than to slide the film into position?
4. How should the film's long axis be positioned for radiographs of posterior teeth?
5. How is the periapical film packet retained in position during exposures?
6. Why should you extend the film's edge about one-fourth inch beyond the biting surface of the teeth?
7. List the teeth which should be shown in each of the following radiographic views:
   a. Molar. b. Bicuspid. c. Cuspid. d. Incisor.
8. List five counteractions that may be effective in reducing or eliminating a gag reflex.
9. Why shouldn't you tell the patient, "You are a gagger," or, "I'll try not to gag you"?

10. How is the bitewing film packet retained in position during the exposure?

629. State the effects of vertical and horizontal angulation and indicate where the central ray should be projected.

Tube Positioning. The X-ray tube and film must be aligned in such a way that the positioning will preclude or at least reduce distortion that would otherwise occur in the image. Three factors are involved in the tube positioning. They are the vertical angulation, horizontal angulation, and projection of the central ray. Let's first discuss the vertical angulation.

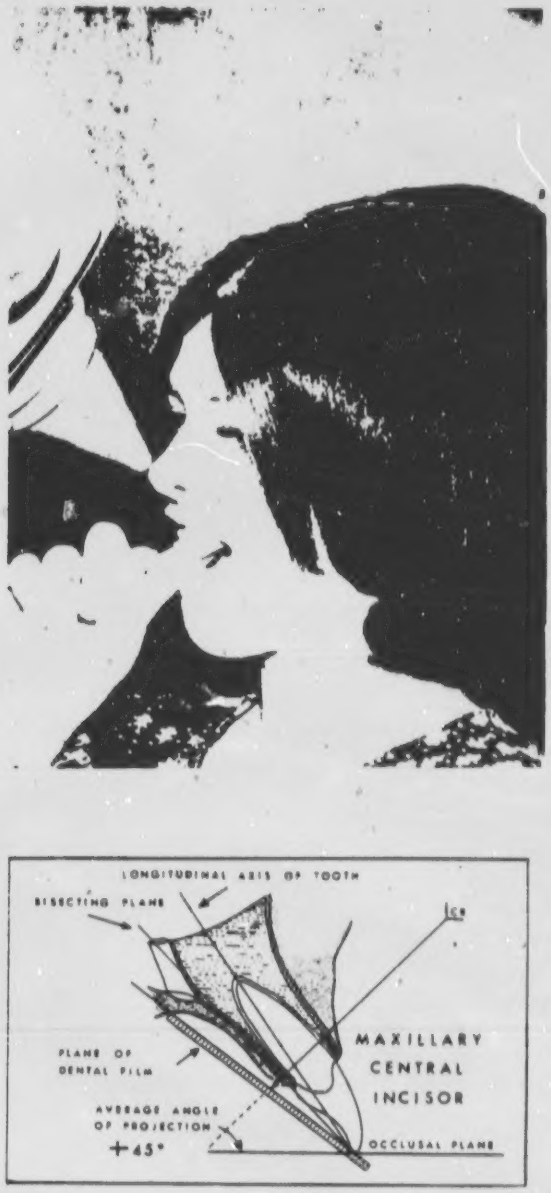

LONGITUDINAL AXIS OF TOOTH
BISECTING PLANE
CR
PLANE OF DENTAL FILM
MAXILLARY CENTRAL INCISOR
AVERAGE ANGLE OF PROJECTION
+45°
OCCLUSAL PLANE

Figure 2-9. Maxillary central incisor.

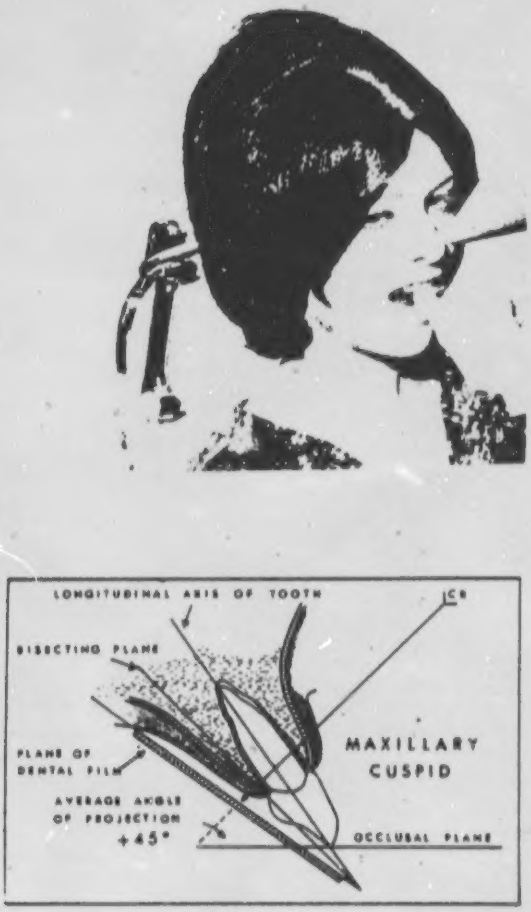
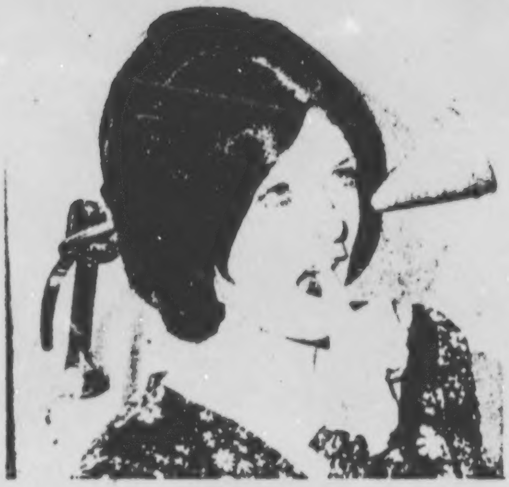

LONGITUDINAL AXIS OF TOOTH
CR
BISECTING PLANE
MAXILLARY CUSPID
PLANE OF DENTAL FILM
AVERAGE ANGLE OF PROJECTION
+45°
OCCLUSAL PLANE

Figure 2-10. Maxillary cuspid.

Vertical angulation. The greatest difficulty the operator will have is producing a film image that is the same length as the teeth involved. This is controlled by the vertical angulation. Probably the easiest way for you to understand the effects of vertical angulation is to compare it with a shadow that the sun casts or projects onto the ground as it strikes an upright object. If the sun is low in the sky, the object's shadow is considerably longer than the object; this effect is called *elongation*. If the sun is high in the sky, such as at noon, the object's shadow is much shorter than the object; this effect is called *foreshortening*. (See fig. 2-7.) Similar to the shadows projected by the sun, in radiography we are faced



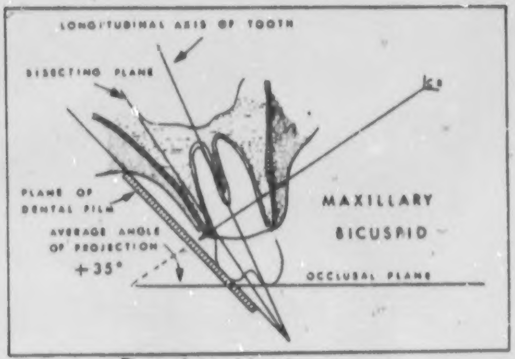
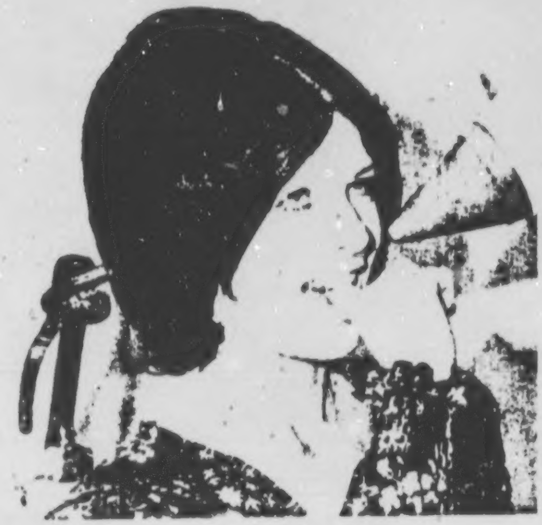

LONGITUDINAL AXIS OF TOOTH
BISECTING PLANE
CR
PLANE OF DENTAL FILM
AVERAGE ANGLE OF PROJECTION
+35°
MAXILLARY BICUSPID
OCCLUSAL PLANE

Figure 2-11. Maxillary bicuspid.

with the task of projecting the tooth's image onto the film. And, furthermore, we must project it in such a way that the size of our radiographic image is the same size as the tooth. This, as we said earlier, is controlled by vertical angulation. Too much vertical angulation and we have a foreshortened image—too little, an elongated image.

Ideally, the film should be parallel to the tooth, and the rays should be directed at a right angle to the long axis of the tooth. In the 8-inch, short cone technique, however, the tissue structure and the shape of the oral cavity cause the film to be farther from the tooth root than it is from the crown. This produces an angle between the tooth and the recording plane of the film—much like the angle between the upright object and the ground (recording plane) we used in discussing the sun as the projecting force. If the rays are then projected at a right angle to the long axis of the tooth, an elongated image will be produced on the film. To overcome this difficulty, project the rays at the imaginary line which bisects the angle formed by the long axis of the tooth and the recording plane of the film. (See fig. 2-5.)

Horizontal angulation. Projecting the rays parallel with the interproximal spaces of the teeth and at right angles to the film will prevent overlapping and will show a distinct image of each tooth on the film. This principle is illustrated in figure 2-8. Notice that the diagram shows how the central ray (CR) is to be aimed. Two methods may be employed on each patient to obtain proper horizontal angulation. For the anterior teeth, use the sighting method by standing behind the tube head and sighting down the cone. For posterior teeth, use the paralleling method. Align the face of the tube head so that it is parallel with the edge of the film.



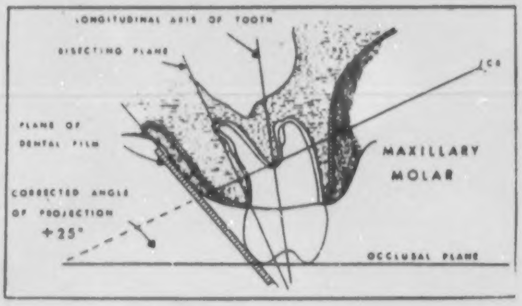

LONGITUDINAL AXIS OF TOOTH
BISECTING PLANE
CR
PLANE OF DENTAL FILM
MAXILLARY MOLAR
CORRECTED ANGLE OF PROJECTION
+25°
OCCLUSAL PLANE

Figure 2-12. Maxillary molar.

Projection of the central ray. Even when you know the angulation to apply to the cone, it is difficult to know exactly where to center the cone. The projection is a problem because the film packet and the teeth are covered by the cheeks and lips. For this reason, imaginary lines are projected on the face of the patient to help you in positioning the cone.

For the upper jaw, the ala-tragus line is used. Points are laid out on this line below anatomical landmarks to aid you in projecting the central ray. The following points are for use on the upper teeth:

- For the upper molars, the tip of the cone is centered on the ala-tragus line below the outer angle of the eye and below the zygoma.
- For the bicuspids, the cone is centered below the pupil of the eye.
- For the lateral incisor and cuspid, the cone is centered at the ala of the nose.
- For the central incisors, the cone is centered through the tip of the nose.

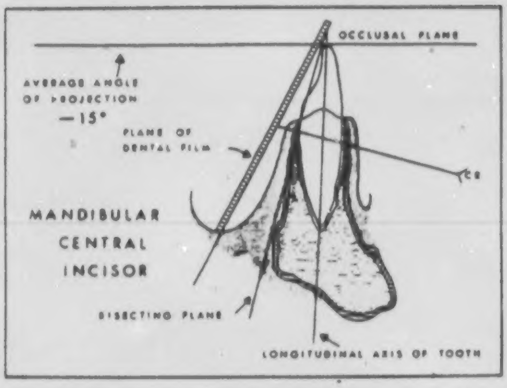

OCCLUSAL PLANE
AVERAGE ANGLE OF PROJECTION
—15°
PLANE OF DENTAL FILM
CR
MANDIBULAR CENTRAL INCISOR
BISECTING PLANE
LONGITUDINAL AXIS OF TOOTH

Figure 2-13. Mandibular central incisors.

For the lower jaw, an imaginary line is projected one-fourth inch above the lower border of the mandible from the angle to the symphysis. The points at which the cone is directed on the lower jaw are immediately below those described for the corresponding teeth of the upper jaw. After the film and cone are properly positioned, the exposure is made by simply depressing the exposure button.

Exercises (629):

1. What is the result of too much vertical angulation?

2. What is the result of too little vertical angulation?

3. How should the central ray be projected to obtain a radiographic image that is the same size as the tooth?

4. What results from improper horizontal angulation?

5. On what imaginary line should the cone tip be positioned for maxillary exposures?

6. On what imaginary line should the cone tip be positioned for mandibular exposures?

In items 7 through 10 indicate what anatomical point in column B is used as the reference point for the radiographic view listed in column A by matching the point in column B to the view in column A.

Column A	*Column B*
___ 7. Bicuspids.	a. The outer edge of the eye.
___ 8. Central incisors.	b. The pupil of the eye.
___ 9. Lateral incisors and cuspids.	c. The tip of the nose.
___ 10. Molars.	d. The ala of the nose.

630. Given a series of factors related to the exposure of short cone radiographs, match each to its appropriate specific exposure.

Specific Short Cone Exposures. Normally 16 radiographic exposures constitute a full mouth series. This series is composed of 14 periapical and 2 bitewing views. The technique for each specific exposure is presented to be used only as a guide. Each exposure discussed is also illustrated to give you a better understanding of the principles involved. The vertical angulations we suggest are based on the angulations that are appropriate for the average patient. You may, however, find it necessary to alter this technique because of the various types of equipment used throughout the Air Force and also because of the difference in anatomical structures of the oral cavity, since no two mouths are exactly alike. Let us begin our discussion with the maxillary central incisors:

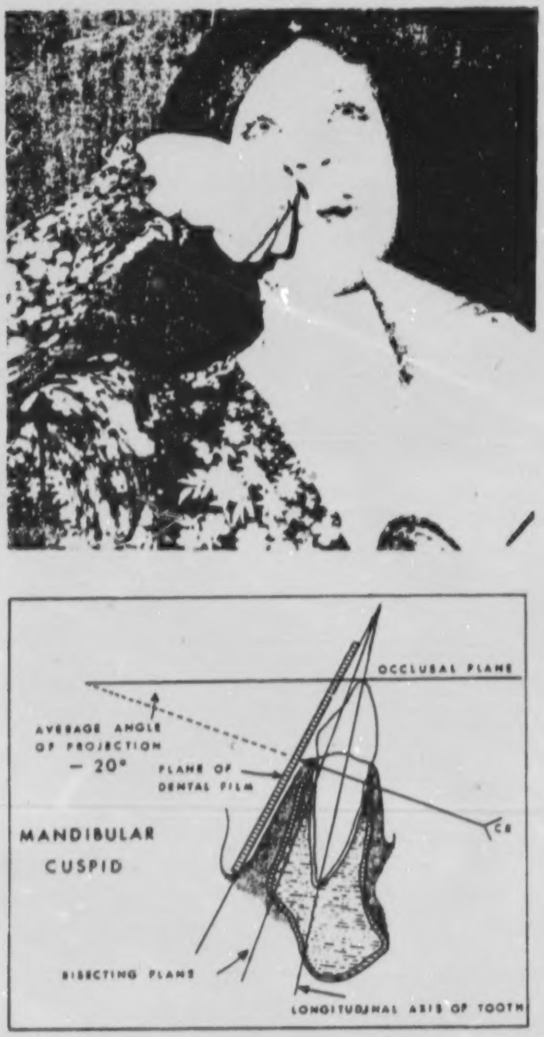


Figure 2-14. Mandibular cuspid.

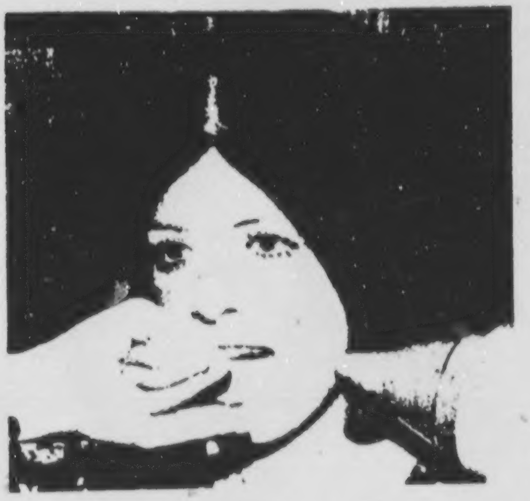
a. Maxillary central incisors. Refer to figure 2-9 as we explain the procedure for taking periapical X-rays of the maxillary central incisors. Position the patient's head so that the median sagittal plane is vertical and the ala-tragus line is horizontal. Gently flex the upper corners of the film packet and place the film in the mouth with the long axis of the film in the median sagittal plane. The lower edge of the packet must be parallel to and about one-fourth inch below the incisal surfaces of the teeth. Have the patient hold the packet with his thumb against its upper third. Direct the central ray through the tip of the nose at the root tips (apices) of the central incisors. The pointer should read about 45° below the centerline for proper vertical angulation. To insure correct horizontal angulation, sight down the cone to line up with the proximal spaces.

b. Maxillary lateral incisor and cuspid. Refer to figure 2-10 as we discuss the procedure for taking a periapical X-ray of the maxillary lateral incisor and cuspid. The median sagittal plane must be vertical and the ala-tragus line horizontal. Flex the mesial corner of the film packet slightly and place it in the mouth with the long axis of the packet in a vertical plane coinciding with the lateral incisor and cuspid contact area. The lower edge of the packet must be parallel to and about one-fourth inch below the incisal surfaces of the teeth. The patient's thumb should hold the packet by pressure against its upper mesial corner. Direct the central ray through the canine fossa at the ala. The pointer should read about 45° below the centerline for proper vertical angulation. Sight down the cone to line up with the proximal spaces to achieve the proper horizontal angulation.

c. Maxillary bicuspids and first molar. The procedure for taking a periapical X-ray of the maxillary bicuspids and first molar is illustrated in figure 2-11. The median sagittal plane must be vertical and the ala-tragus line horizontal. Flex the mesial corner of the packet slightly and place the film in the mouth perpendicular to the long axis of the second bicuspid. The lower edge of the packet must be parallel to and about one-fourth inch below the occlusal surfaces of the teeth. The patient's thumb should hold the film by light pressure against the upper third portion of the packet. Direct the central ray at the ala-tragus line through a point slightly distal to the root tip (apex) of the second bicuspid tooth. The pointer should read about 35° below the centerline for proper vertical angulation. Sight through the second bicuspid-first molar contact area for proper horizontal angulation.

d. Maxillary second and third molars. The procedure for taking a periapical X-ray of the maxillary second and third molars is illustrated in figure 2-12. The median sagittal plane must be vertical. The ala-tragus line must be horizontal. The patient's thumb should hold the packet by light pressure against the upper third of the film. Place the film with its long axis in a horizontal plane. The shorter center axis of the packet must coincide with the long axis of the second molar tooth. The lower edge of the packet is parallel to and about one-fourth inch below the occlusal surfaces of the teeth. Direct the central ray at the ala-tragus line below the outer corner of the eye and at a point between the facial root tips of the second molar. The pointer should read about 25° below center for proper vertical angulation. The face of the X-ray head should parallel the film packet.

e. Mandibular central incisors. The procedure for taking a periapical X-ray of the mandibular central incisors is illustrated in figure 2-13. The median sagittal plane must be vertical. The ala corner of the mouth line must be horizontal. Flex the lower corners of the packet slightly and place the film in the mouth with its long axis parallel to the central incisors. The lower edge of film must lie under the tip of the tongue, and the upper edge must be parallel to and about one-fourth inch below the incisal surfaces of the teeth. The patient's forefinger must hold the packet by light pressure against its center. The central ray should be directed in the median sagittal plane at just about the tip of the chin and between the root tips of the central incisors. The pointer should read about 15° above center for proper vertical angulation. Horizontal angulation is obtainable by paralleling the face of the X-ray head with the film packet.



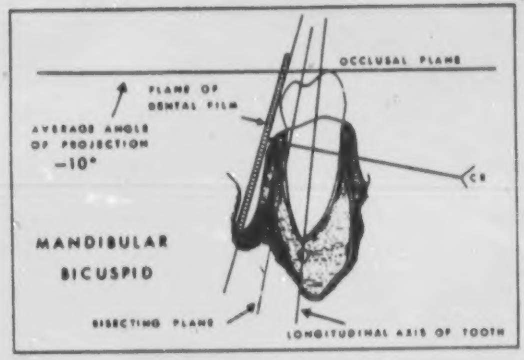

OCCLUSAL PLANE
PLANE OF DENTAL FILM
AVERAGE ANGLE OF PROJECTION
−10°
CR
MANDIBULAR BICUSPID
BISECTING PLANE
LONGITUDINAL AXIS OF TOOTH

Figure 2-15. Mandibular bicuspid.

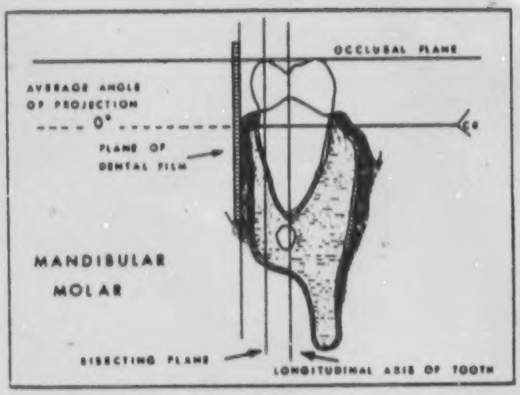

OCCLUSAL PLANE
AVERAGE ANGLE OF PROJECTION
0°
CR
PLANE OF DENTAL FILM
MANDIBULAR MOLAR
BISECTING PLANE
LONGITUDINAL AXIS OF TOOTH

Figure 2-16. Mandibular molar.

f. Mandibular lateral incisor and cuspid. The procedure for taking a periapical X-ray of the mandibular lateral incisor and cuspid is illustrated in figure 2-14. The median sagittal plane must be vertical. The ala corner of the mouth line must be horizontal. Flex the lower mesial corner of the packet slightly and place the film in the mouth with the long center axis of the packet coinciding with the long axis of the cuspid tooth. The upper edge of the film must be parallel to and about one-fourth inch above the incisal and occlusal surfaces of the teeth. Have the patient use his forefinger to hold the film by exerting light pressure against the center of the packet. Direct the central ray through the root tip of the cuspid tooth to the center of the packet at a point about one-fourth inch above the lower border of the mandible. The pointer should be about 20° above center for proper vertical angulation. Parallel the face of the X-ray head with the film packet for proper horizontal angulation.

g. Mandibular bicuspids and first molar. The procedure for taking a periapical X-ray of the mandibular bicuspids and first molar is illustrated in figure 2-15. The median sagittal plane must be vertical. The ala corner of the mouth line must be horizontal. Flex the lower mesial corner of the packet slightly and place it in the mouth with its long axis in the horizontal plane. The short axis of the packet must coincide with the long axis of the second bicuspid tooth. The upper edge of the film must be parallel to and about one-fourth inch above the occlusal surface of the teeth. The patient's forefinger holds the film by light pressure against the upper center of the packet. Direct the central ray through the root tips of the second bicuspid tooth to the center of the packet at a point about one-fourth inch above the lower border of the mandible. The pointer should read about 10° above center for proper vertical angulation. Parallel the lower edge of the head of the X-ray machine with the film packet.

h. Mandibular second and third molars. The procedure for taking a periapical X-ray of the mandibular second and third molars is illustrated in figure 2-16. The median sagittal plane must be vertical. The ala corner of the mouth line must be horizontal. Flex the mesial corner of the packet slightly and place it in the mouth with its long axis in the horizontal plane. The short axis of the packet should coincide with the long axis of the second molar. Again, the upper edge of the film must be parallel to and about one-fourth inch above the occlusal surfaces of the teeth. The patient's forefinger is used to hold the film by applying light pressure against the center of the packet. You should then direct the central ray through the root tips of the second molar to the center of the packet at a point about one-fourth inch above the lower border of the mandible. The pointer should read near 0° for proper vertical angulation. For proper horizontal angulation, the head of the X-ray machine should be placed parallel with the film packet.

Exercises (630):

Indicate the factors related to the exposure of specific radiographs by matching the appropriate items in column B to the specific exposure listed in column A. Item (1) of each exposure listed in column A should be matched with a response from group I in column B, item (2) with a response from group II, and item (3) with a response from group III.

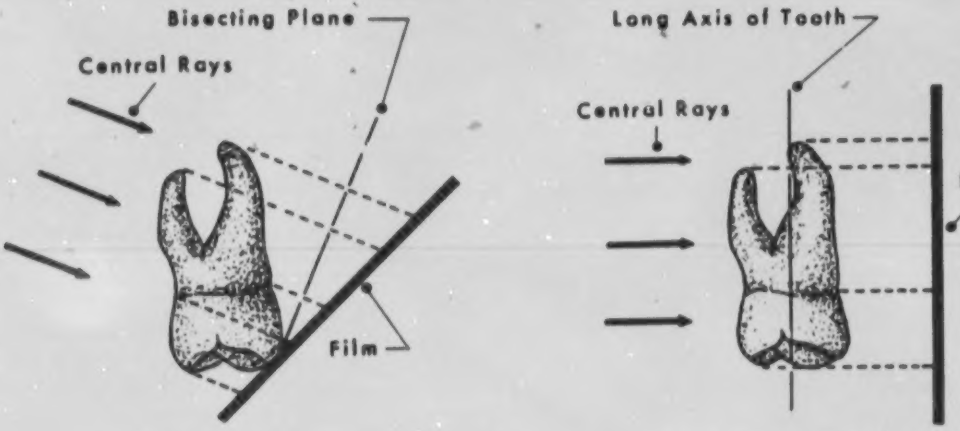
Column A

1. Mandibular central incisors:
   ___ (1) Vertical angulation.
   ___ (2) Film position.
   ___ (3) Entry point of central ray
2. Maxillary molars:
   ___ (1) Vertical angulation.
   ___ (2) Film position.

Column B

Group I

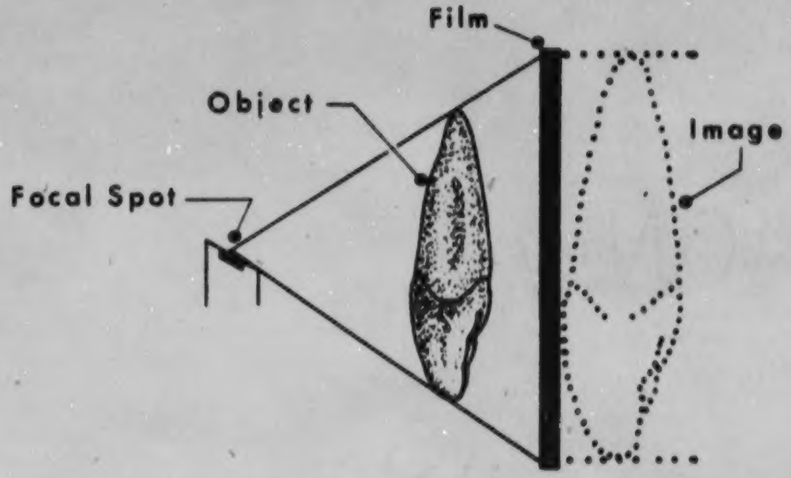
a. 25° below centerline.
b. 35° below centerline.
c. 40° below centerline.
d. 45° below centerline.
e. 0° angulation.
f. 10° above centerline.
g. 15° above centerline.
h. 20° above centerline.



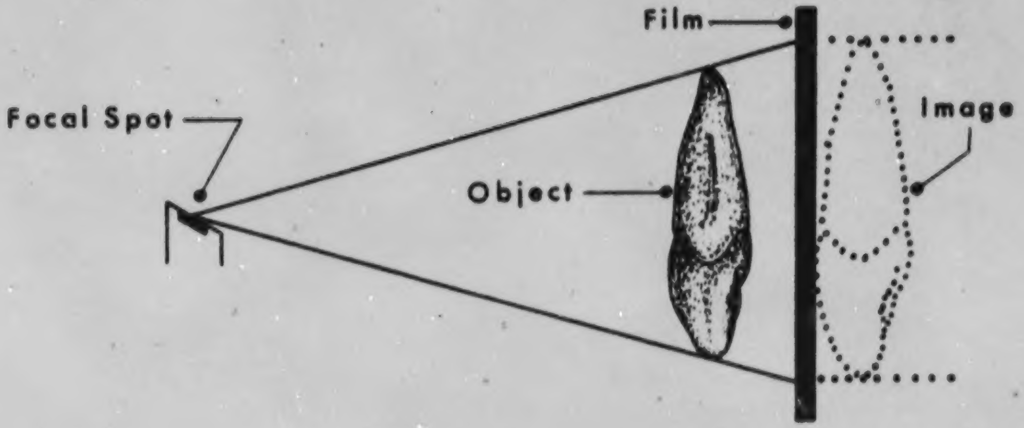
Short Cone Technique

Long Cone Technique

Figure 2-17. Comparison of the short and long cone principles.



8 inch Focal-Film Distance



16 inch Focal-Film Distance

Figure 2-18. Comparison of focal-film distance.

___ (3) Entry point of central ray.

3. Mandibular bicuspids:
___ (1) Vertical angulation.
___ (2) Film position.
___ (3) Entry point for central ray.

4. Maxillary lateral incisors and cuspids:
___ (1) Vertical angulation.
___ (2) Film position.
___ (3) Entry point of central ray.

5. Mandibular molars:
___ (1) Vertical angulation.
___ (2) Film position.
___ (3) Entry point of central ray.

6. Maxillary bicuspids:
___ (1) Vertical angulation.
___ (2) Film position.

Group II

a. Long axis of the film packet in the vertical position.
b. Long axis of the film packet in the horizontal position.

Group III

a. Ala-tragus line below the corner of the eye.
b. Tip of the nose.
c. Ala-tragus line below the pupil of the eye.
d. One-fourth inch above the lower border of the mandible and below the corner of the eye.
e. One-fourth inch above the lower border of the mandible and below the tip of the nose.

___ (3) Entry point of central ray.

7. Maxillary central incisors:
___ (1) Vertical angulation.
___ (2) Film position.
___ (3) Entry point of central ray.

8. Mandibular lateral incisors and cuspids:
___ (1) Vertical angulation.
___ (2) Film position.
___ (3) Entry point of central point.

f. At the ala of the nose.
g. One-fourth inch above the lower border of the mandible and below the pupil of the eye.
h. One-fourth inch above the lower border of the mandible and below the ala of the nose.

631. State the principle of the long cone radiographic technique and tell how it differs from the short cone technique.

Long Cone Periapical Technique. The short cone technique produces some undesirable results.

The most objectionable one is dimensional distortion, which cannot be completely avoided even by the most skilled technician. In this section we discuss the long cone technique, which minimizes dimensional distortion and presents the objects being radiographed in their true anatomical relationship and size.

Principle of the long cone technique. The principle of the long cone technique is to direct the X-ray beam perpendicular to the recording plane of the film, which has been positioned *parallel* to the long axis of the tooth. A comparison of the long and short cone principles is illustrated in figure 2-17. The long axis requires use of extension cones supplied by the manufacturer of the X-ray machine. The extension cone increases the focal (target) film distance from approximately 8 inches (with the short cone) to 16 to 20 inches. With the longer focal-film distance, enlargement of the image is reduced. (See fig. 2-18.) Additionally, with the increased target-film distance the exposure time must be increased. Read the film manufacturer's instructions for the recommended exposure time. Normally, long cone radiographs are exposed at 90kV, 15mA.

Exercises (631):

1. State the principle of the long cone radiographic technique.

2. What advantage does the long cone technique have over the short cone technique?

3. What target-film distance is employed with the long cone technique? Why?

4. What adjustment in the exposure time must be accomplished when you go from the short cone to the long cone technique?

632. State the purpose of the X-C-P instrument, identify its components, and describe their assembly.

The X-C-P Instrument. The variety of anatomical conditions of individual mouths presents problems in obtaining a parallel relationship between the film packet, the structures to be radiographed, and the tube head. These difficulties usually can be overcome by the use of intra-oral film holders such as the Rinn X-tension C-one P-aralleling (X-C-P) instrument (shown in fig. 2-19). When you use this instrument, it is not necessary to maintain the patient in the standard dental radiographic position. By rotating or tipping the patient's head, or by adjusting the dental chair to a convenient position, it is usually possible to align the extension tube with the X-C-P instrument regardless of space limitations or restricted mobility of the X-ray unit. Alignment of the extension tube with the X-C-P instrument can also be accomplished with the patient in a supine position. This requires minimal maneuvering of the X-ray unit, with the final alignment being made by adjusting the patient's head. Placement of the film is simplified and well tolerated by the patient in this position.

There are two X-C-P instruments used to assist in the taking of long cone radiographs. One is for anterior exposures; the other is for posterior exposures. Both the anterior and posterior instruments consist of a bite-block, an indicator rod, and a locator ring. (See fig. 2-19.) The anterior bite-block back support is designed to hold the film's long axis in the vertical position while the posterior bite-block back support holds the film in the horizontal position. You can easily distinguish between the indicator rods as the posterior rod has a long, straight extension that bends off the main shaft at a 90° angle to attach to the bite-block. The extension off the main shaft of the anterior rod consists of a series (3) of short 90° bends. The plastic locator rings differ in that the anterior ring's neck is considerably shorter than that of the posterior ring.

For anterior exposures (fig. 2-19,A), place the shielded (printed) side of the film packet against the backing support of the bite-block. Insert the film *vertically* into the slot by using a downward motion, and at the same time place slight pressure against the backing support to open the slot. Hold the offset portion of the indicator rod away from the biting surface of the block. Insert the pins into the proper holes. Slide the plastic locator ring onto the indicator rod so that it is in front of the film packet. The instrument is now ready to position in the mouth.

For posterior exposures (fig. 2-19,B), place the shielded (printed) side of the film packet against the backing support of the bite-block. Insert the film *horizontally* into the slot by using a downward motion and at the same time place slight pressure against the back support to open the slot. Hold the right-angle portion of the indicator rod anterior to the block and away from the film. Insert the pins into the proper holes. There are three holes in the bite-block, which allow a choice for lingual positioning of the film. Slide the locator ring onto the indicator rod so that it is in front of the film packet. The instrument is ready to position in the mouth.

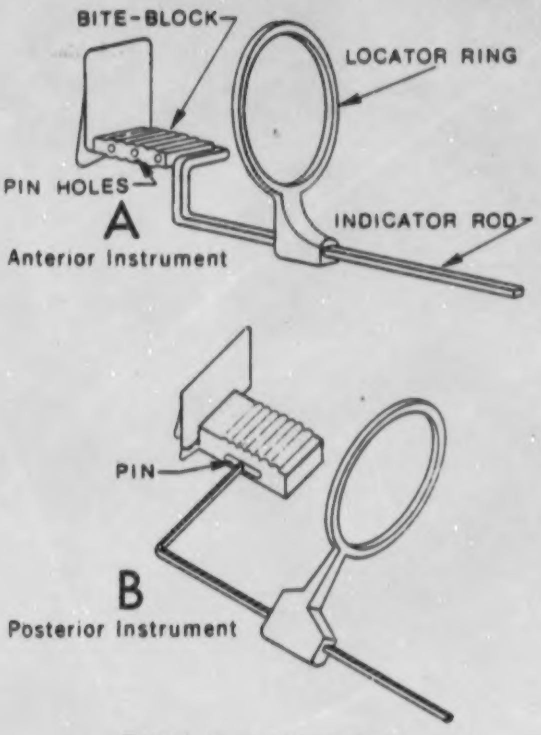

BITE-BLOCK
LOCATOR RING
PIN HOLES
A
Anterior Instrument
INDICATOR ROD
PIN
B
Posterior Instrument

Figure 2-19. X-C-P instruments.

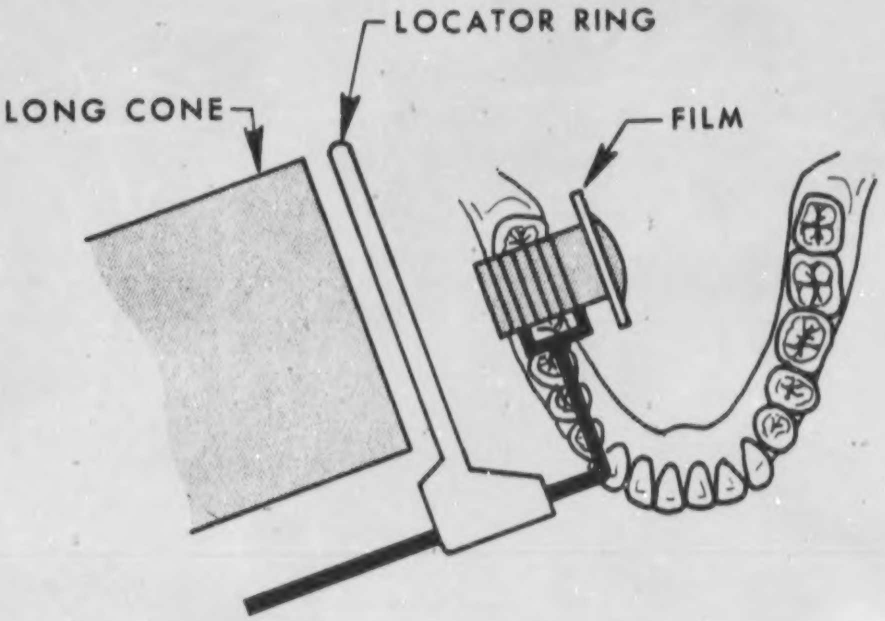
Exercises (632):

1. What is the purpose of the X-C-P instrument?

2. Must the patient be maintained in the standard radiographic position when you use the X-C-P instrument?

Distinguish between the parts of the anterior and posterior X-C-P instruments by matching the description in column B to the part listed in column A.

Column A	*Column B*
___ 3. Anterior locator ring.	a. Designed to hold the film in a horizontal position.
___ 4. Posterior indicator rod.	b. Has a long, straight extension that bends off its main shaft at a 90° angle.
___ 5. Posterior bite-block.	c. Designed to hold the film in a vertical position.
___ 6. Anterior indicator rod.	d. A plastic, ring-shaped object, having a short neck.
___ 7. Anterior bite-block.	e. A plastic, ring-shaped object, having a long neck.
___ 8. Posterior locator ring.	f. Its extension consists of a series of short 90° bends.


LOCATOR RING
LONG CONE
FILM

NOTE: THE TIP OF THE LONG CONE, LOCATOR RING, AND THE FILM ARE ALL PARALLEL

Figure 2-20. Paralleling in the long cone technique.

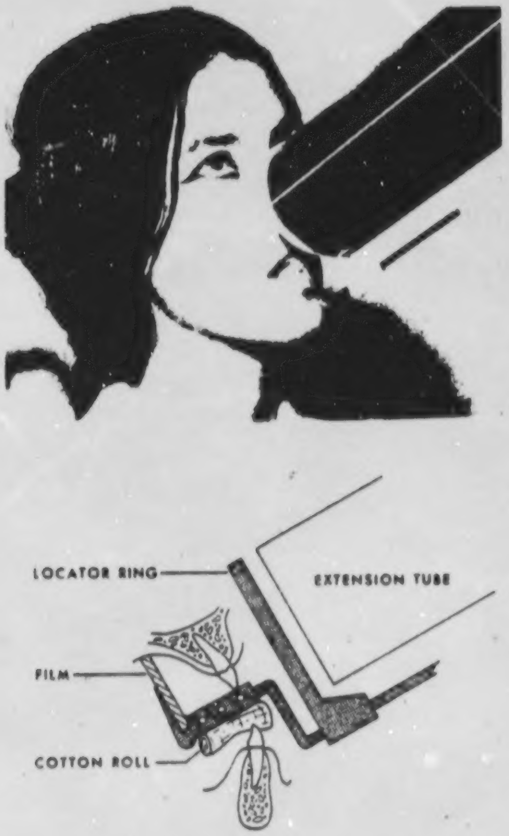


Figure 2-21. Maxillary central incisors.

9. When you place the film packet in the X-C-P instrument, which side of the packet should be against the backing support of the bite-block?

10. Briefly describe how the posterior X-C-P instrument is assembled. (Omit the film placement.)

633. Indicate the positioning procedures involved in taking long cone radiographs by stating the proper longitudinal film position, the alignment, the X-C-P instrument, and the procedure employed for edentulous patients, and by identifying the teeth upon which the film should be centered.

Specific Periapical Radiograph Exposures—Long Cone. The techniques presented in the following paragraphs are to be used only as a guide. Each procedure is illustrated to help you understand the principles involved. When placing the film in the patient's mouth for long cone exposures, do not attempt to place the film directly against the teeth. The film must be positioned somewhat towards the midline if the proper parallelism is to be achieved. (See fig. 2-20.) With this in mind, let's see how we set up for the specific exposures:

a. Maxillary incisor region. For the maxillary incisor region, assemble the anterior instrument. Center the film packet with the midline, and parallel it with the long axis of the incisors. The entire length of the block should be utilized to position the film in the region of the first molar. Rest the block on the incisal edges of the teeth to be radiographed. Insert a cotton roll between the mandibular incisors and the block. Instruct the patient to close firmly to retain established position of the film. Slide the locator ring down the indicator rod to approximate the skin surface and align the extension tube of the X-ray unit with the rod and ring on vertical and horizontal planes. This procedure is shown in figure 2-21.

b. Maxillary cuspid region. To radiograph the maxillary cuspid region, assemble the anterior

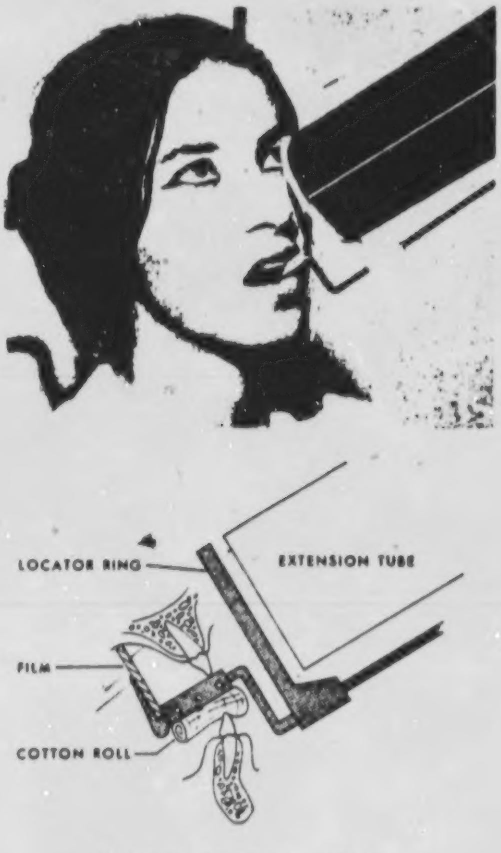


Figure 2-22. Maxillary cuspid incisors.

instrument with the film inserted vertically. Center the film on the cuspid, and parallel it with the long axis of the tooth. Rest the block on the maxillary cuspid. Insert a cotton roll between the mandibular teeth and the block. Instruct the patient to close firmly on the block to retain the established position of the film. Slide the locator ring down the indicator rod to approximate the skin surface. Align the extension tube of the X-ray unit with the rod and ring on vertical and horizontal planes. (See fig. 2-22.)

c. *Maxillary bicuspid region.* For the maxillary bicuspid region, assemble the posterior instrument with the film inserted horizontally in the bite-block. Position the film in the mouth with the second bicuspid centered on the film. Parallel the film with the long axis of the bicuspids. Hold the bite-block on the occlusal surfaces of the maxillary bicuspid. Insert a cotton roll between the bite-block and the mandibular teeth. Instruct the patient to close firmly to retain the established position of the film. Slide the locator ring down the indicator rod to approximate the skin surface, and align the extension tube of the X-ray unit with both the rod and ring on horizontal and vertical planes. (See fig. 2-23.)

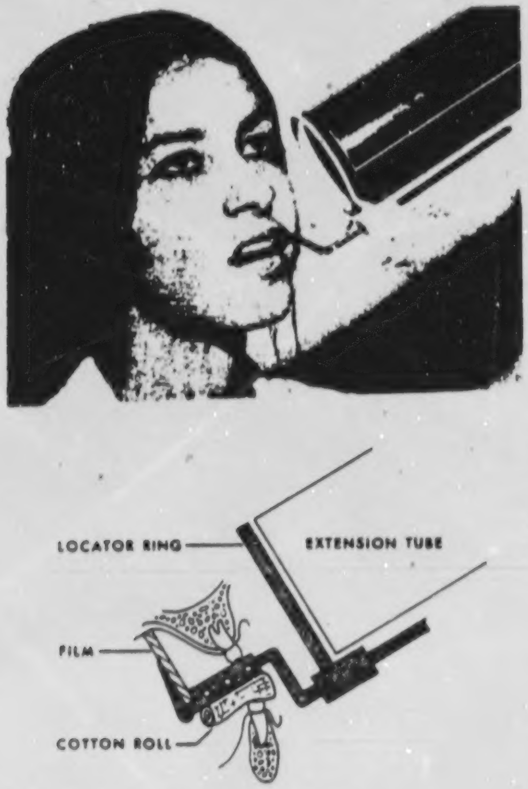


Figure 2-23. Maxillary bicuspid incisors.

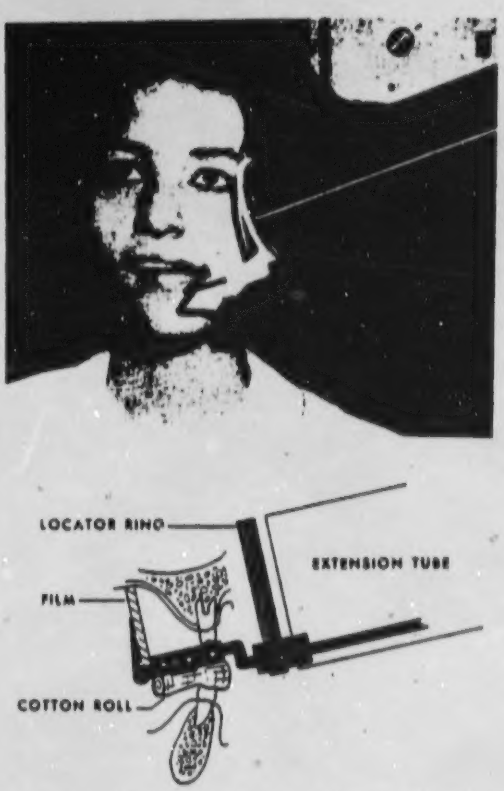


Figure 2-24. Maxillary molar incisors.

d. *Maxillary molar region.* To radiograph the maxillary molar region, assemble the posterior instrument with the film inserted horizontally in the bite-block. Position the film in the mouth with the anterior edge of the film in the vicinity of the first molar-second bicuspid contact point. Parallel the film with the long axes of the molars. Place a cotton roll between the underside of the bite-block and the mandibular molars. Have the patient close firmly to retain the established position of the film. Slide the locator ring down the rod to approximate the skin surface, and align the extension tube of the X-ray unit with both the rod and ring on horizontal and vertical planes. (See fig. 2-24.)

e. *Mandibular incisor region.* For the mandibular incisor region, assemble the anterior instrument and insert the film vertically in the bite-block. Center the film with the midline, and parallel it with the long axes of the incisors. Lingual placement of the film packet to the region of the second bicuspid will accomplish this. Rest the block on the incisal edges of the teeth to be radiographed. Insert a cotton roll between the top of the block and the maxillary incisors. Instruct the patient to close firmly to retain the established position of the film. Slide the locator ring down the indicator rod to approximate the skin surface.

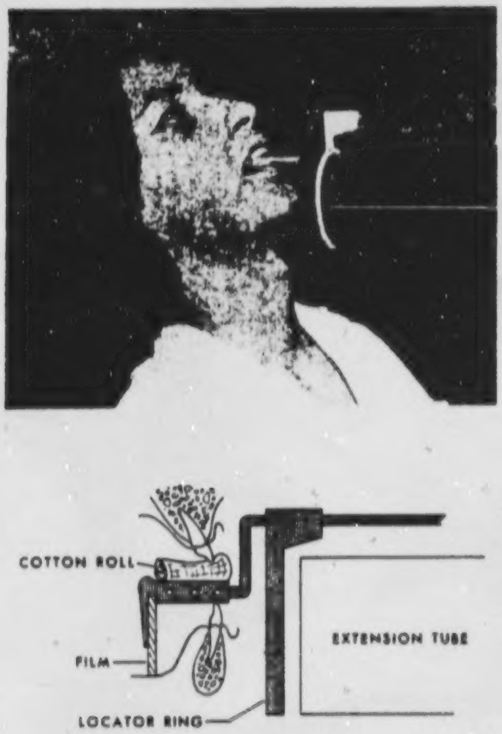


Figure 2-25. Mandibular central incisors.

Align the extension tube of the X-ray unit with the rod and ring on vertical and horizontal planes. (See fig. 2-25.)

f. Mandibular cuspid region. To radiograph the mandibular cuspid region, assemble the anterior instrument with the film inserted vertically in the bite-block. Center the film on the cuspid and parallel it with the long axis of the tooth. Rest the block on the mandibular cuspid and insert a cotton roll between the block and the maxillary teeth. Instruct the patient to close firmly to maintain the established position of the film. Slide the locator ring down the indicator rod to approximate the skin surface. Align the extension tube with the rod and ring on vertical and horizontal planes. (See fig. 2-26.)

g. Mandibular bicuspid region. With the posterior instrument assembled and the film inserted horizontally in the block, position the film in the mouth with the second bicuspid centered on the film. Parallel the film with the long axes of the bicuspids. Place the block on the occlusal surfaces of the mandibular bicuspids. Insert a cotton roll between the block and the maxillary teeth. Have the patient close firmly to retain the established position of the film. Slide the locator ring down the indicator rod to approximate the skin surface and align the extension tube with the rod and ring on horizontal and vertical planes. (See fig. 2-27.)

h. Mandibular molar region. To radiograph the mandibular molar region, assemble the posterior instrument with the film inserted horizontally in the bite-block. Position the film in the mouth with the anterior edge of the film in the vicinity of the first molar-second bicuspid contact point. Parallel the film with the long axes of the molars. Place a cotton roll between the block and the opposing maxillary teeth. Have the patient close firmly to retain the established position of the film. Slide the locator ring down the indicator rod to approximate the skin surface. Align the extension tube with the rod to approximate the skin surface. Align the extension tube with the rod and ring on horizontal and vertical planes. (See fig. 2-28.)

i. Edentulous patients. To radiograph partially edentulous patients, place a cotton roll in the space normally occupied by the crowns of the missing teeth and then follow the standard procedure. For completely edentulous patients, cotton rolls may be taped to the bite-block to fill the space normally filled by the crowns of the teeth. Parallel the film with the ridge area being examined. Have the patient close down to hold the film in the desired position. It may also be necessary for you to vary the standard technique for patients with variations

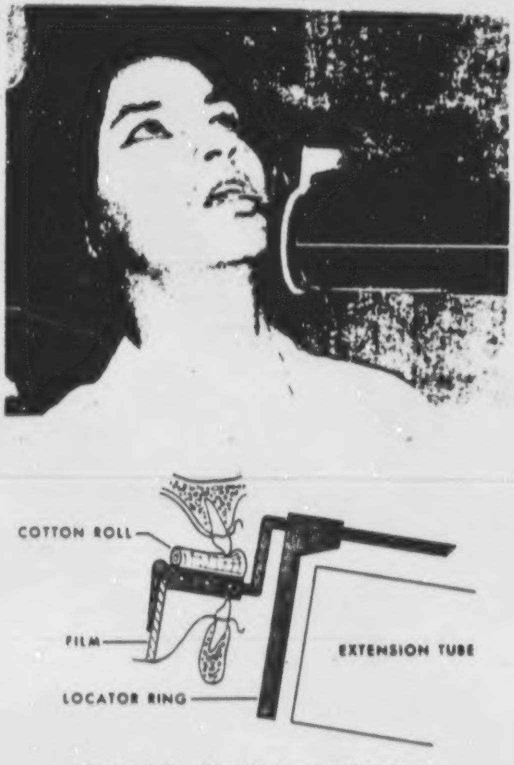


Figure 2-26. Mandibular cuspid incisors.

in the shape of the oral structures, such as low palates and malpositioned teeth.

Exercises (633):

1. In what position should the long axis of the film packet be positioned for exposures of the incisors and cuspids?

Identify the proper position of the film packet in relationship to the teeth being radiographed by matching the film position in column B to the radiograph in column A.

Column A

____ 2. Incisor regions.
____ 3. Bicuspid regions.
____ 4. Cuspid regions.
____ 5. Molar regions.

Column B

a. The anterior edge of the film should be in the vicinity of the first molar-second bicuspid contact point.
b. The second bicuspid is centered on the film.
c. The midline is centered on the film.
d. The film is centered behind the cuspid.

6. When you use the long cone technique with the X-C-P instrument, what approximates the patient's skin surface?

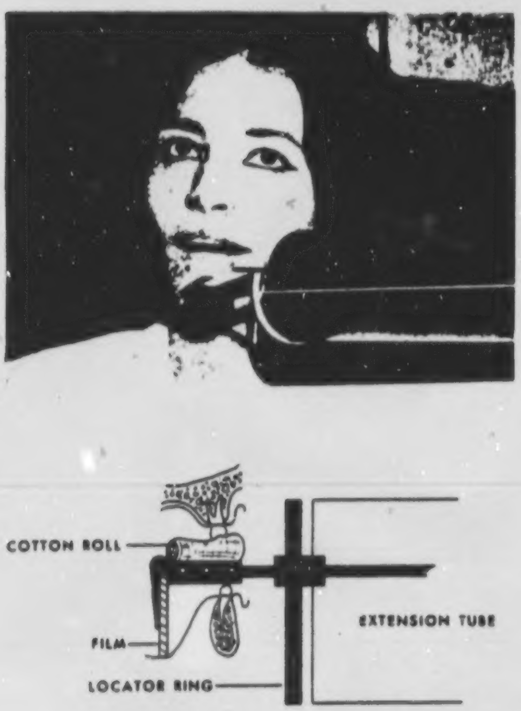


Figure 2-27. Mandibular bicuspid incisors.

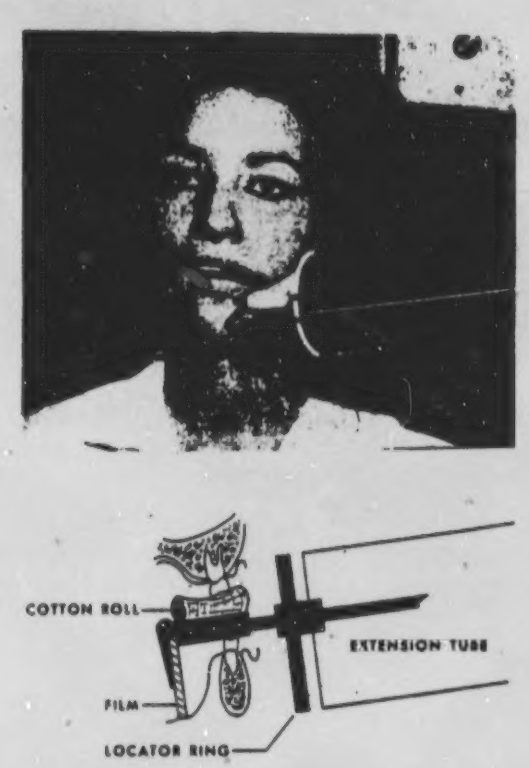


Figure 2-28. Mandibular molar incisors.

7. What is aligned to the X-C-P locator ring when you take long cone radiographs?

8. When you radiograph edentulous or partially edentulous patients, what should you do prior to taking the exposure?

634. State the purpose of bitewing radiographs and describe the proper patient, film, and central ray positioning needed for their exposure.

Bitewing Technique. The interproximal or bitewing examination is primarily used to reveal the presence of caries in the crowns of the teeth, particularly early lesions on the interproximal surfaces. During this examination we are also able to observe certain changes in the pulp chambers and pulp canals, the presence of overhanging fillings, improperly fitting crowns and fixed partial dentures, and resorption or destruction of the crest of the alveolar bone.

The posterior interproximal exposure is the standard procedure for taking a posterior bitewing radiograph. The median sagittal plane must be vertical and the ala-tragus line horizontal. Have the patient close his teeth firmly on the bite tab. Place the film packet so that its greatest dimension lies in a horizontal plane, parallel with the long axis of the crown of the teeth. The forward edge of the film packet should be placed behind the distal one-third of the cuspid teeth. This insures that the entire crown of the first bicuspid appears on the radiograph. Do not permit the film to rotate as the patient closes his mouth. Direct the central ray toward the occlusal plane at the center of the packet. (See fig. 2-29.) The pointer should read about 8° below the centerline for proper vertical angulation. Sight straight through the maxillary second bicuspid-first molar contact area for proper horizontal angulation. Accuracy is essential to avoid overlapping of structures.

Exercises (634):

1. For what purpose are bitewing radiographs primarily used?

2. Describe the position in which you should place the patient for the exposure of bitewing radiographs.

3. How should the film be positioned for bitewing radiographs?

4. How should the central ray be directed for the exposure of bitewing radiographs?

635. State the purpose of the occlusal examination and identify the conditions in which the occlusal radiograph could have great diagnostic value.

Occlusal Radiographic Examination. The occlusal examination is so called because the film packet is placed in the occlusal plane for exposure. It is a supplementary procedure that allows the dental officer to view many oral conditions from a

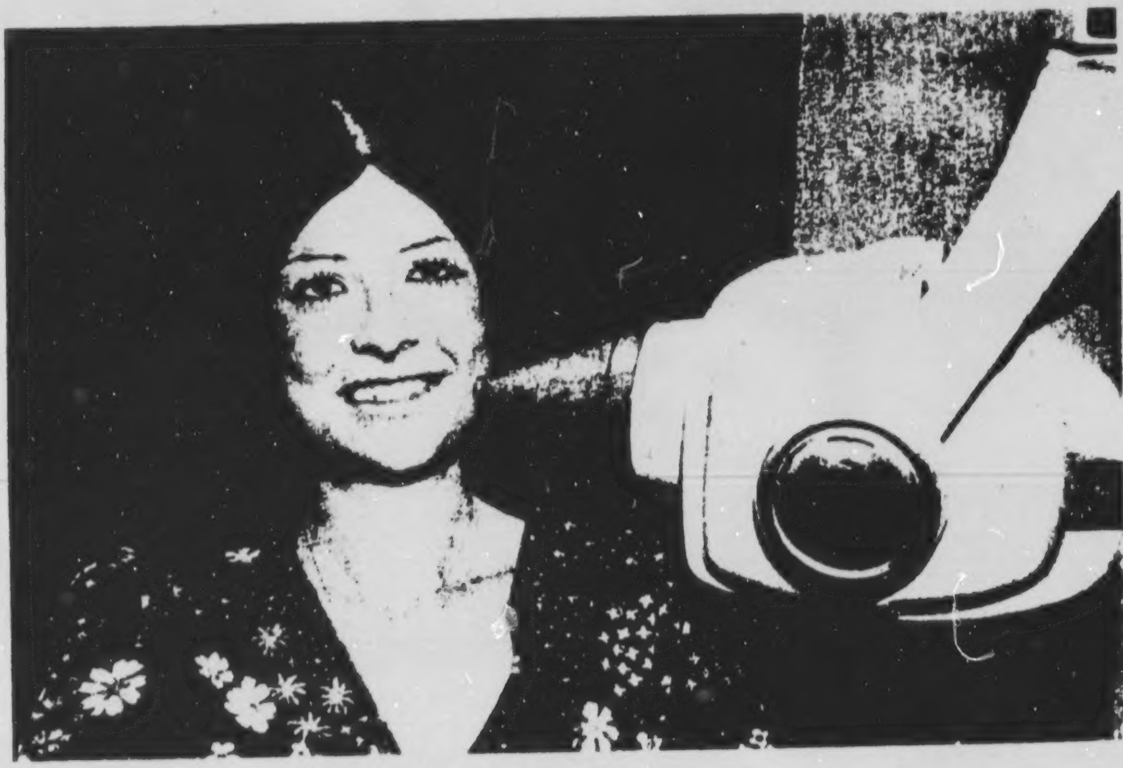
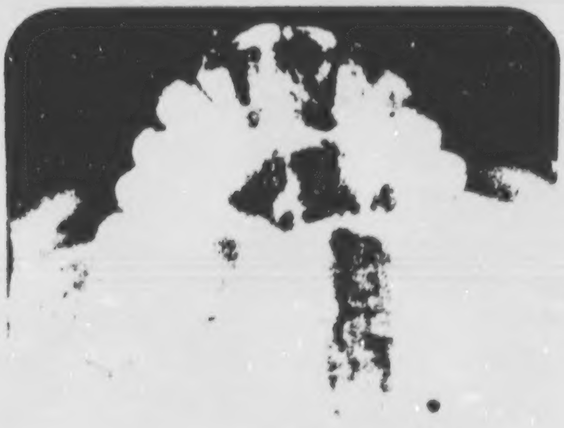
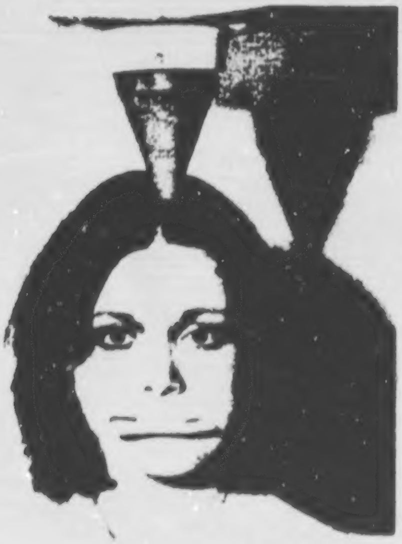


Figure 2-29. Bitewing technique.

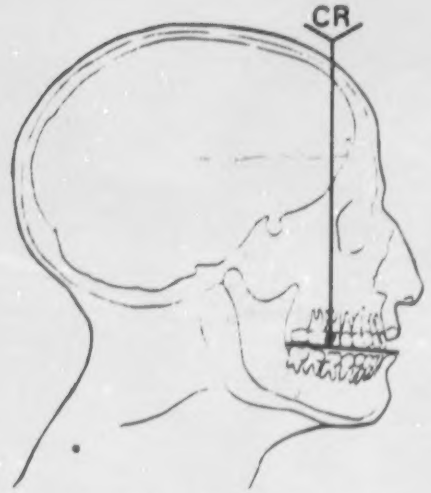
350



EXPOSED FILM



FILM PLACEMENT



CENTRAL RAY PROJECTION

Figure 2-30. Maxillary topographical occlusal.

cross sectional aspect that cannot be achieved with other types of intra-oral film. These radiographs are of great value in the diagnosis of antral involvements, the relationship of foreign bodies in the jaw or maxillary sinuses, bone fractures, presence of salivary calculi (stones), the location of areas of bone involvement, cysts, impacted teeth, and malignancies.

Exercises (635):

1. Generally speaking, what does the occlusal examination allow the dental officer to view?

Items 2 through 8 list several oral conditions. Place a checkmark next to those in which an occlusal examination would prove to be of great diagnostic value.

___ 2. Periapical abscess.
___ 3. Maxillary bone fracture.
___ 4. Salivary stones.
___ 5. Dental granuloma.
___ 6. Foreign bodies in a sinus.
___ 7. Periodontitis.
___ 8. Impacted teeth.
___ 9. Gingivitis.

636. Given a series of statements concerning the occlusal exposure technique, indicate which are true and which are false.

Occlusal Exposure Techniques. The occlusal

357

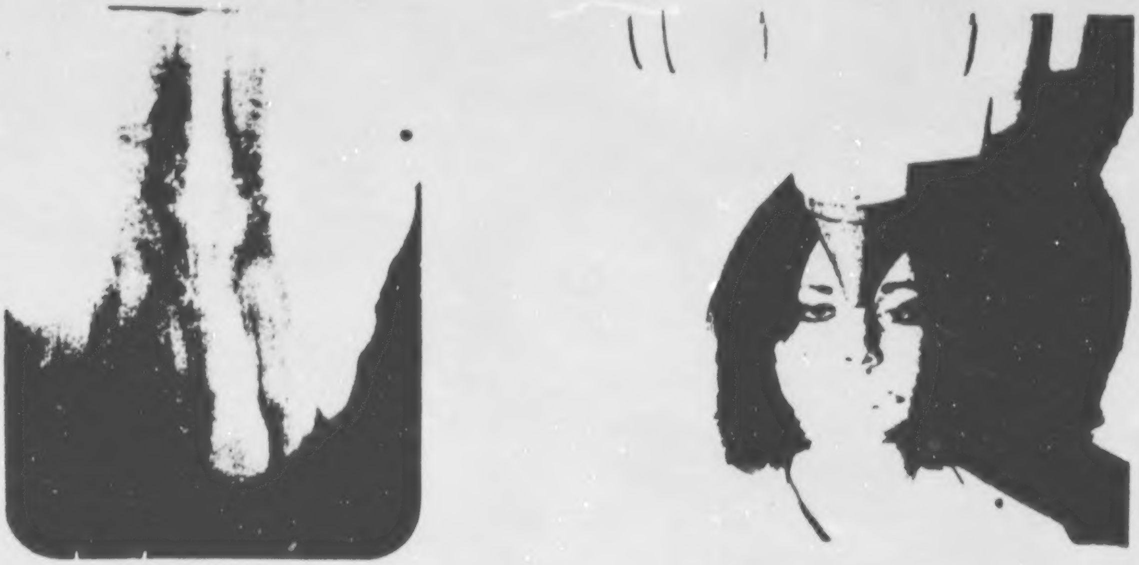
film packets, previously discussed, are normally used to record occlusal radiographs. In the cases of children, or adults with extremely small mouths a periapical film packet may be substituted for the occlusal packet. For both maxillary and mandibular exposures, the patient's median sagittal line should be kept in the vertical plane. Position the patient's ala-tragus line parallel to the floor for maxillary exposures. During mandibular exposures the patient's head should be tilted back until his ala-tragus line is perpendicular with the floor.

Position the film packet so that its recording plane is facing the structures to be radiographed. Insert the film packet into the patient's mouth and have him bite down firmly, but gently, on the packet to retain it in position.

Exercises (636):

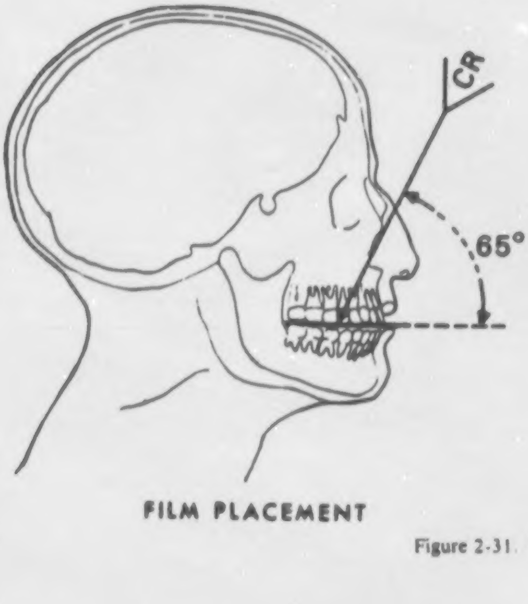
Indicate whether the following statements concerning the occlusal exposure technique are true or false by circling the appropriate T or F.

T F 1. In the cases of children, or adults with extremely small mouths, a periapical film packet may be substituted for the occlusal packet.



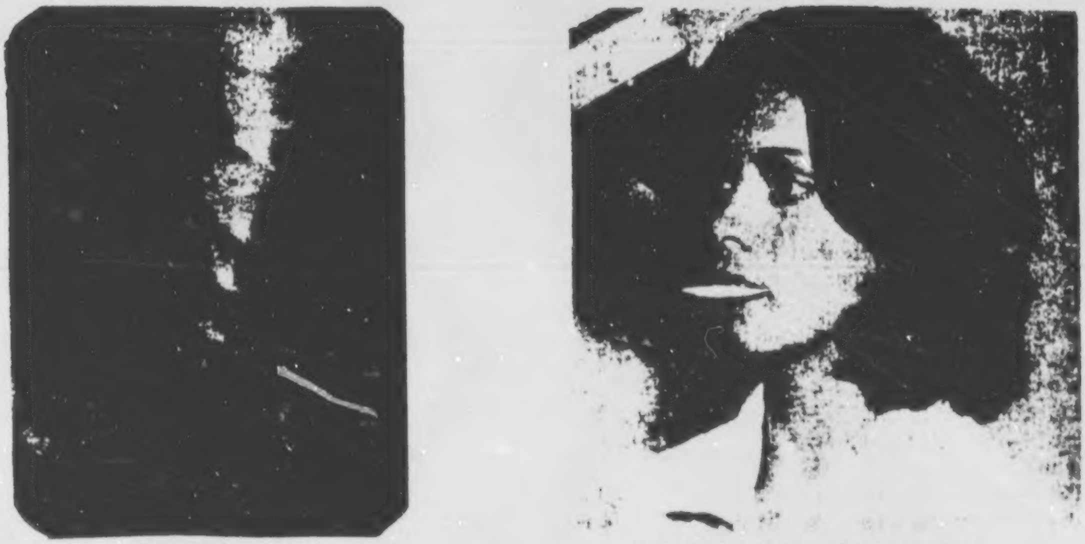
EXPOSED FILM

CENTRAL RAY PROJECTION



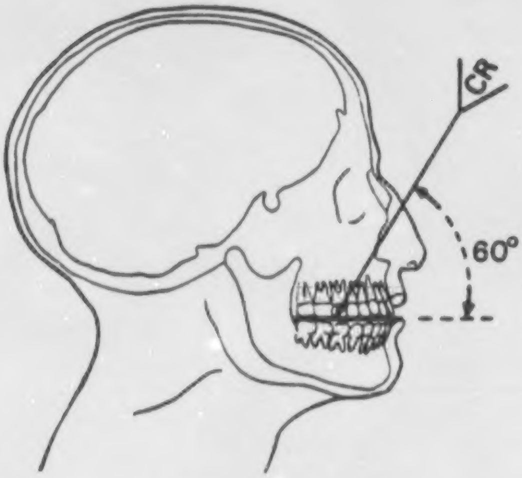
FILM PLACEMENT

Figure 2-31. Maxillary anterior occlusal.



EXPOSED FILM

CENTRAL RAY PROJECTION



FILM PLACEMENT

Figure 2-32. Maxillary posterior occlusal.

T F 2. During occlusal exposures the patient's median sagittal line should be kept in the vertical plane.
T F 3. The patient's ala-tragus line should be positioned parallel to the floor for mandibular exposures.
T F 4. The film packet should be positioned so that its recording plane is facing the structures to be radiographed.
T F 5. The film packet is retained in position by having the patient press on it firmly with his thumb or forefinger.

637. Given procedures necessary for the production of various occlusal radiographs, match each procedure with the specific radiograph to which it would apply.

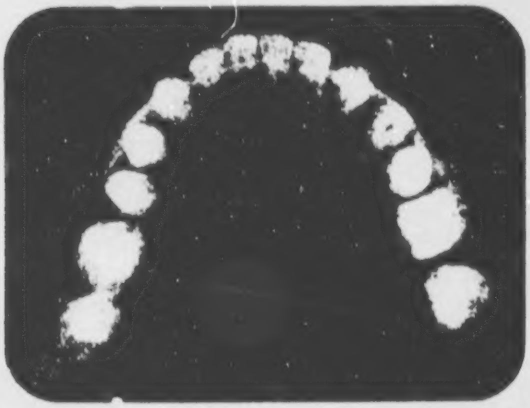
Specific Occlusal Exposures. The following paragraphs describe the procedures involved in the setup for several specific occlusal examinations. These setups are illustrated in figures 2-30 through 2-35. Use the exposure time, kVp, and mA settings recommended by the film's manufacturer.

Maxillary topographical occlusal. As with all maxillary exposures, the patient's ala-tragus line should parallel with the floor. Place the film packet in the mouth with its long dimension extending across the mouth. Be sure the film is placed far enough distally to include all the teeth, then have the patient bite down gently on the film packet. Adjust the tube head so that the central ray enters along the median line at the top of the head. When viewed from the side, the path of the central ray should be aligned with the outer corner of the patient's eye. The cone tip should be directed straight down (90°) toward the film packet. See figure 2-30.

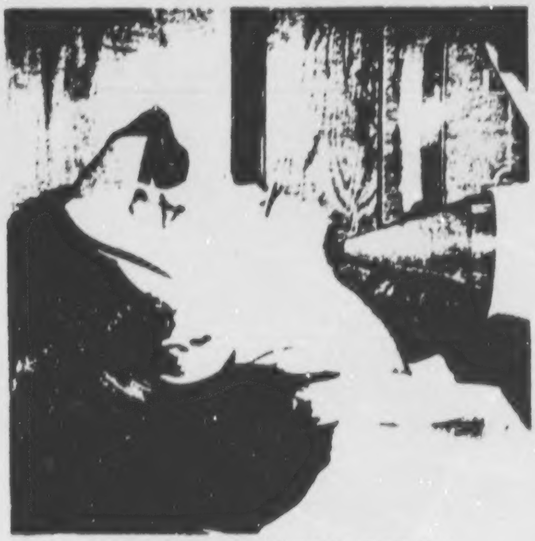
Maxillary anterior occlusal. Again, position the patient so that his ala-tragus line is parallel with the floor. Place the film in the mouth with its short dimension extending across the mouth, and have the patient bite down gently on the film packet. Direct the central ray to enter at 65° downward in the midsagittal plane, at the interior border of the nasal bones. (See fig. 2-31.) Sight between the central incisors to establish proper horizontal angulation.

Maxillary posterior occlusal. The patient's ala-tragus line should once more be parallel with the floor. Position the film in the mouth on the side to be radiographed with its long axis parallel to the median plane. The lone aspect of the film packet that lies toward the cheek should be parallel with and should extend at least one-fourth inch beyond the facial cusps of the posterior teeth. Have the patient hold the film packet in position by gently closing his teeth together. Adjust the tube to a vertical angulation of 60° downward. Direct the central ray to pass through the ala of the nose toward the apical region of the cuspid and first bicuspid to the plane of the film packet. (See fig. 2-32).

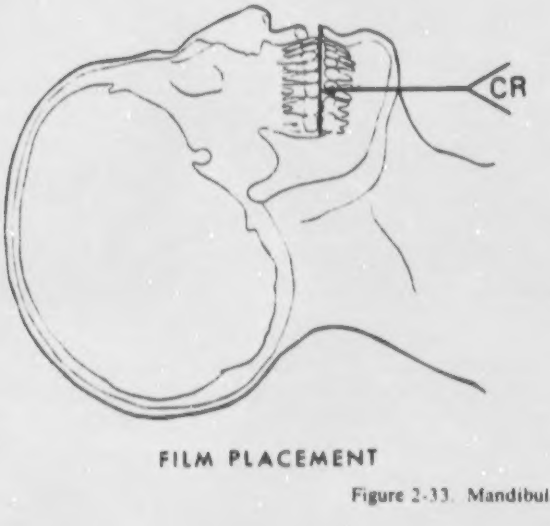
Mandibular topographical occlusal. Tilt the patient's head back so that the ala-tragus line and occlusal plane of the teeth are perpendicular to the floor. Keep the median facial plane in a vertical position. Place the film packet in the mouth with its long axis extending across the mouth. Be sure the film is placed far enough distally to include all the



EXPOSED FILM

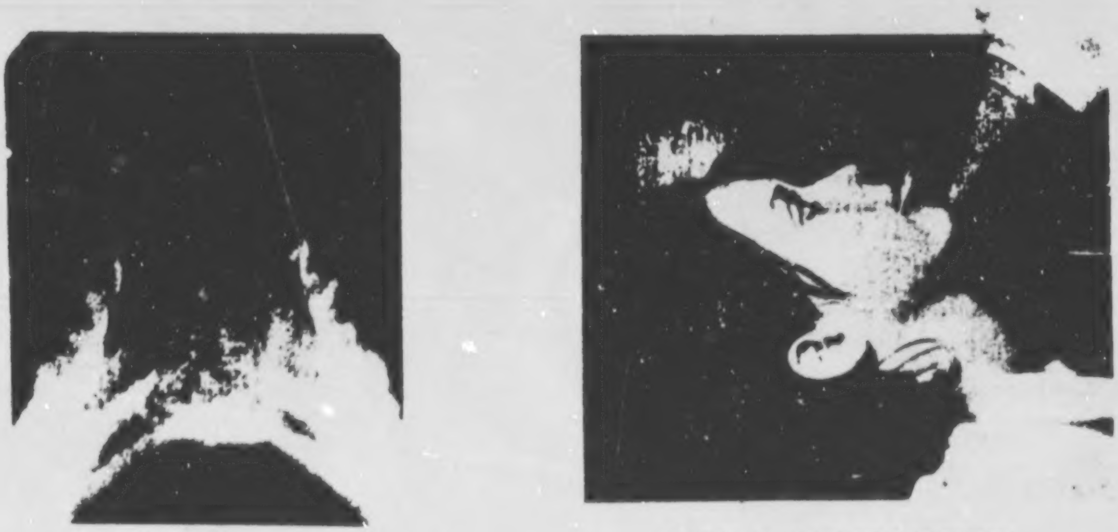


CENTRAL RAY PROJECTION



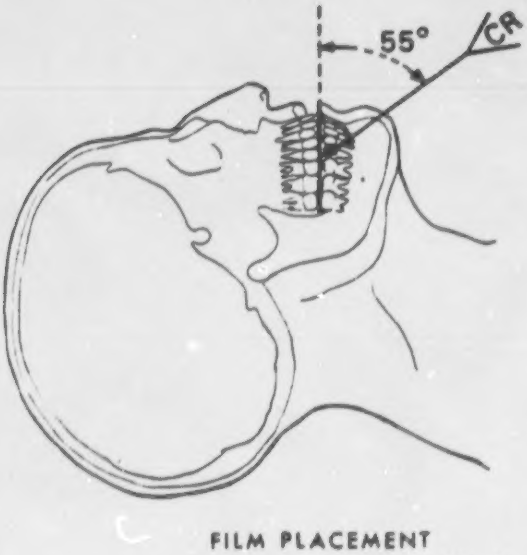
FILM PLACEMENT

Figure 2-33. Mandibular topographical occlusal



CENTRAL RAY PROJECTION

EXPOSED FILM



FILM PLACEMENT

Figure 2-34. Mandibular anterior occlusal

teeth and have the patient bite gently on the film packet. The central ray should be directed perpendicular to the recording plane of the film packet, this of course means using 0° vertical angulation. The tube pointer should be positioned under the chin on the median line at a spot between the mandibular first molars. The ray should pass through the floor of the mouth to the center of the film. (See fig. 2-33).

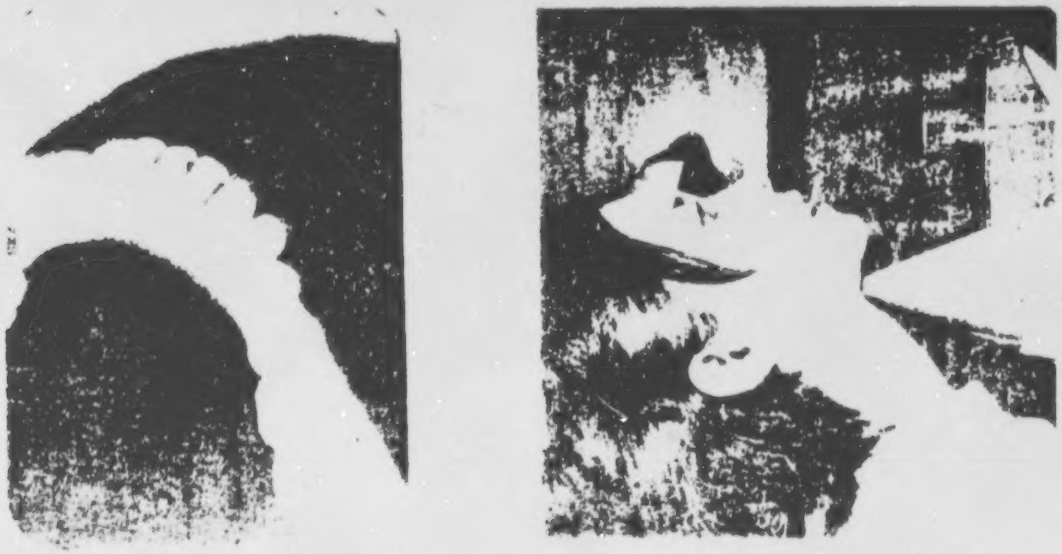
Mandibular anterior occlusal. Tilt the patient's head back so that the ala-tragus line and the teeth are perpendicular to the floor. Keep the median facial plane in the vertical position. Place the film in the mouth with its lesser dimension extending across the mouth and have the patient bite down on the film packet. Adjust the tube to a vertical angulation of 35° downward. Position the tube so that the central ray enters at the median line of the chin just below the apices of the mandibular central incisors. (See fig. 2-34).

Mandibular posterior occlusal. Tilt the patient's head back so that the ala-tragus line and the teeth are perpendicular to the floor. Keep the median facial-plane in the vertical position. Place the film in the mouth on the side to be radiographed with its long axis parallel to the median plane. The long aspect of the film packet that lies toward the cheek should be parallel with and extend one-fourth inch beyond the facial cusps of the posterior teeth. Have the patient hold the film in position by gently biting on the film packet. Adjust the vertical angulation so that the central ray is directed perpendicular to the film packet. If the film packet is perfectly perpendicular to the floor, 0° vertical angulation would be used. Direct the central ray so that it will pass from below the mandible and through the second molar to the center of the film packet. (See fig. 2-35).

Exercises (637):

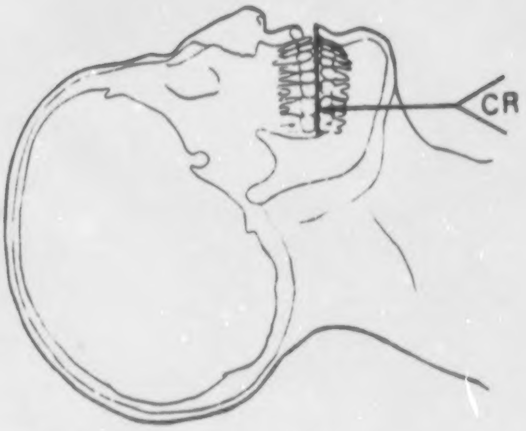
Match the specific radiographs listed in column B to the procedures in column A that are required in the production of a particular radiograph. Each radiograph can be matched to more than one production procedure.

Column A	*Column B*
____ 1. Vertical angulation of 60° downward.	a. Maxillary topographical.
____ 2. Long axis of the film positioned across the mouth.	b. Maxillary anterior.
____ 3. Film positioned to lie parallel with and extend at least one-fourth inch beyond the facial	c. Maxillary posterior.
	d. Mandibular topographical.
	e. Mandibular anterior.
	f. Mandibular posterior.



EXPOSED FILM

CENTRAL RAY PROJECTION



FILM PLACEMENT

Figure 2-35. Mandibular posterior occlusal.

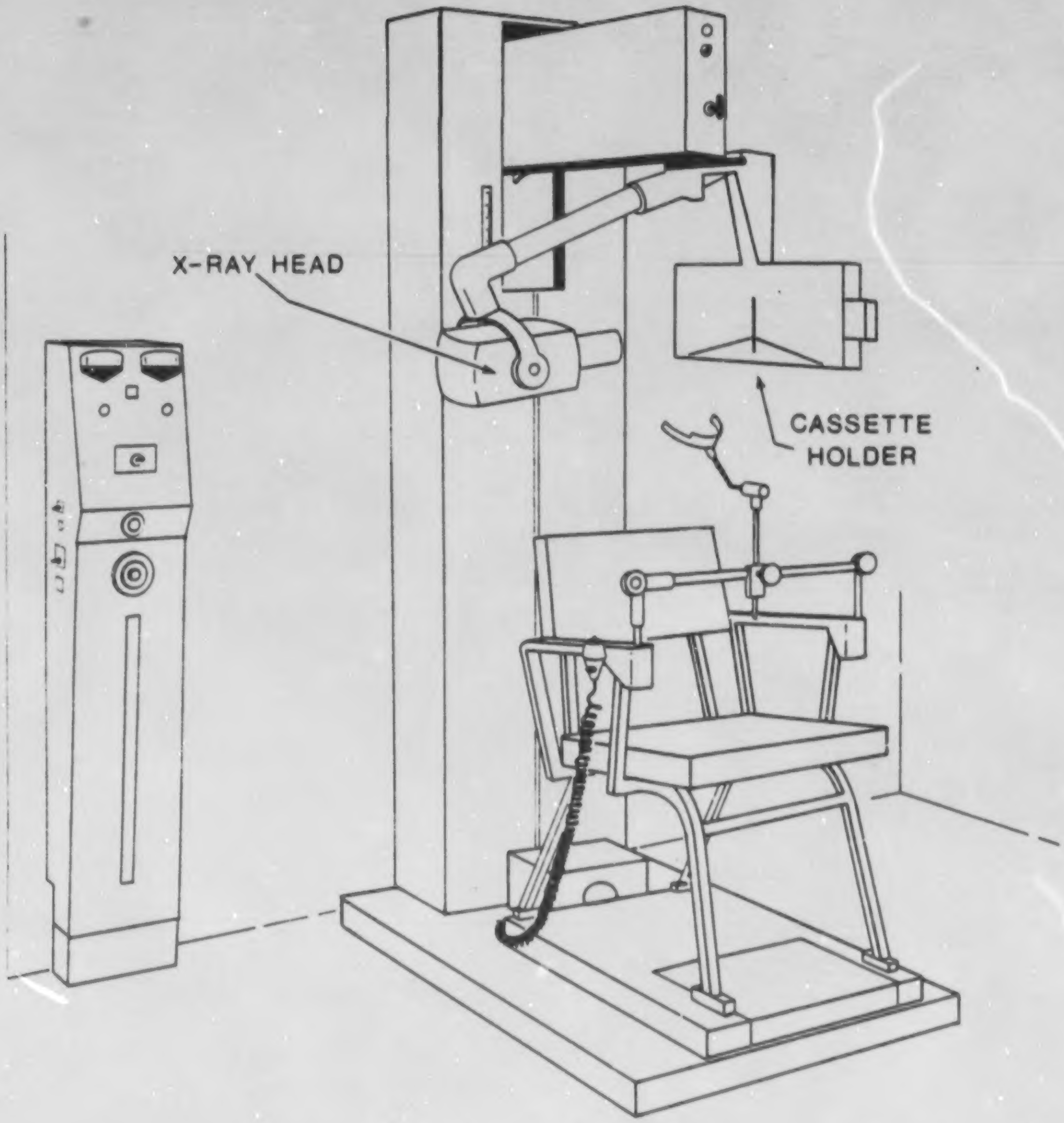


Figure 2-36. Panographic X-ray unit.

Column A

cusps toward the cheeks.

____ 4. Short axis of the film positioned across the mouth

____ 5. Central ray directed 65° downward at interior border of the nasal bones.

____ 6. Central ray direct 90° downward through the top of the head.

____ 7. Position the tube head under the chin on the median line at a spot between the first molars.

Column A

____ 8. Direct the central ray 35° downward through the median line of the chin just below the apices of the mandibular central incisors.

____ 9. When the head is properly positioned the vertical angulation is 0°

____ 10. The central ray is

Column A

projected 60° downward at the ala of the nose toward the apical region of the cuspid and first bicuspid.

638. State the uses of extra-oral radiographs in dentistry and basically describe how they are produced.

Extra-Oral Radiographs. Extra-oral radiographs may be used to obtain a panoramic view of the patient's teeth and their surrounding structure or to view a specific bony area where an abnormality is suspected. The extra-oral radiographs that are most often used in the dental clinic are the panographic radiographs. As the name implies, they provide a panoramic view of oral structures.

Panographic radiographs. The production of panographic radiographs requires special equipment (fig. 2-36 illustrates a panographic unit). The X-ray head and cassette of this unit rotate around the patient, obtaining a complete view of his oral structure. Panographic equipment is useful for obtaining a comprehensive survey of the patient's oral condition. With use of the panographic procedure, the patient receives only about one-tenth the amount of radiation as in a conventional full mouth series. Since the need to place individual film packets in the patient's mouth is eliminated, the panographic technique is also much faster. There is, however, some degree of distortion with all panographic radiographs. Usually the dental officer will order periapical films of any questionable areas he notices on the panographic radiograph. Because of this distortion factor, the panographic technique is fairly limited to obtaining full mouth surveys. Because there are variations in the operation of panographic equipment supplied by different manufacturers, you should read the applicable instructions before attempting any exposures.

Other extra-oral radiographs. The other extra-oral radiographs are used to view a specific part of the anatomy. They may be requested if a fracture is suspected or if the patient is experiencing TMJ problems, sinus pain, etc. These radiographs are obtained by having the patient hold the cassette against the structure to be radiographed and by directing the central ray toward the cassette from the opposite side of the patient's head. Although dental X-ray units may be used to expose these radiographs, better results are usually obtained by having them exposed and processed by the medical X-ray section. Many dental radiography textbooks, describing a multitude of extra-oral techniques, are available for reference should you need to expose extra-oral radiographs with a dental X-ray unit.

Exercises (638):

1. How are extra-oral radiographs employed in dentistry?

2. How does the panographic unit perform to provide a complete view of the patient's oral structure?

3. Why is the panographic technique primarily limited to full mouth surveys?

4. How are extra-oral radiographs of specific bony areas obtained?

2-4. Processing X-Ray Films

Precise methods in processing X-ray films are just as essential as the use of precise exposure techniques. If the correct procedures are followed, the resulting radiograph leaves nothing to be desired, and you can perform your work with every assurance that you are providing radiographs of the highest quality. If, on the other hand, the processing procedures are carelessly done and directions are not carefully followed, all the care that was

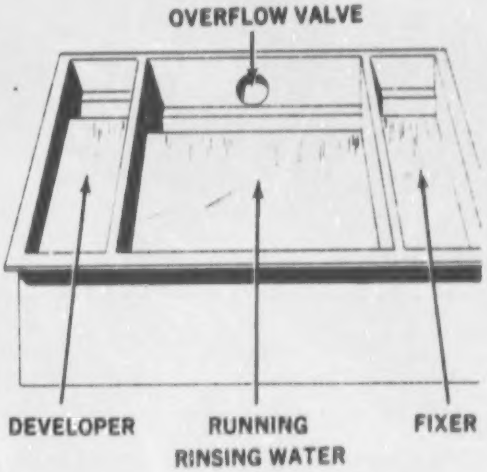


Figure 2-37. X-ray film processing tank

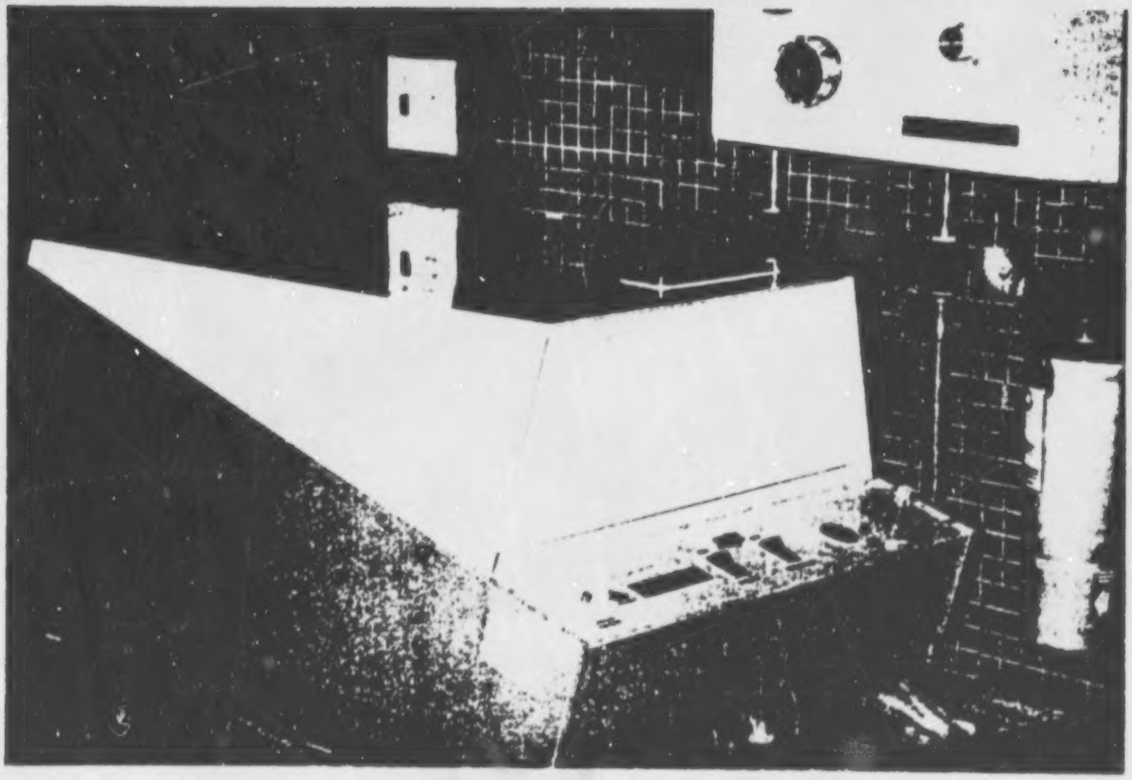


Figure 2-38. Automatic film processor.

exercised during the exposure of the films will be time lost. The processing procedure, using various processing techniques, is carried out in a photographic darkroom.

639. State the need and factors necessary for a properly constructed darkroom, describe the darkroom's contents, and tell how they function.

The Darkroom. Since the films used in X-ray work are extremely sensitive to white light, it is very important to have a good darkroom. It need not be a large room, but it must be constructed so that no light can enter through cracks. In addition, the door should have an inside lock so that no one can accidentally open it or enter while films are being processed. Another type of construction plan for entering the darkroom is a maze that has enough turns to keep out light. Because of its construction, adequate ventilation of the darkroom must not be overlooked. The use of some forced change of air employing a ventilation fan is advisable.

Darkroom illumination. For the illumination of the darkroom, a light that is photographically safe must be used. There are numerous types of safelights available. The safety of the safelight illumination in the darkroom can be tested easily. Darken the room and open the radiographic film packet under safelight illumination. Place the film on the worktable beneath the safelight. Place a coin or paper clip on the open film. Expose it to the safelight for 1 minute and process the film. If you can see the profile of the object, the safelight illumination is not safe.

Processing tank. A suitable tank for processing films is an important part of the darkroom equipment. (See fig. 2-37.) The tank should be constructed of corrosion-resistant and rust-resistant material. Compartments or divisions are provided for the developing and fixing solutions, plus a larger section for water. Since it is essential to process film at the predetermined temperature, the tank must be equipped with a thermometer that will register the exact temperature of the developer solution. This developing temperature can be partly controlled with hot and cold water supply. Most tanks are equipped with refrigeration units that maintain the proper temperature. If the processing tank is not equipped with a refrigeration unit, the incoming pipes should lead to a mixing valve so that the temperature of the water flow can be regulated.

Automatic processor. Many Air Force darkrooms are now equipped with automatic processors. (See fig. 2-38.) Operation of this equipment is relatively simple. You unwrap the film and feed it into a slot on the automatic processor. A conveyor system transports the film through the automatic developer's chemicals, and the processed film is turned out in about 5 minutes. This equipment is available through several manufacturers, and you should be thoroughly familiar with the operating and maintenance instructions furnished by the particular manufacturer of your equipment. The processing tank, interval time, and film holders we discuss in this section all relate to the manual processing method. So do not confuse them with the automatic processing method.

Interval timer. Because of the direct relationship between temperature and time in the processing procedure, it is necessary to know the exact time that any given film is to be left in each solution. For this purpose, an interval timer is needed in the darkroom. This gives the time in minutes and fractions of minutes and is equipped with an alarm, which sounds to indicate the expiration of the time selected.

Film holders. Two types of film holders or hangers should be available in the darkroom. (See fig. 2-39.) One type is for intra-oral film, and the other for extra-oral film. Film should be handled carefully when placing it on the hangers to avoid fingerprints on the film.

Exercises (639):

1. Why is it necessary to develop radiographic film in a darkroom?

2. List the factors that are necessary for an adequately constructed darkroom.

3. How can you determine if your darkroom illumination is adequate?

4. Describe the radiographic processing tank.

5. How may the temperature of the processing solution be controlled?

6. Briefly describe how film is developed in the automatic developer.

7. What is used to indicate the amount of time the film has spent in the processing solutions?

640. Indicate specific factors and procedures in

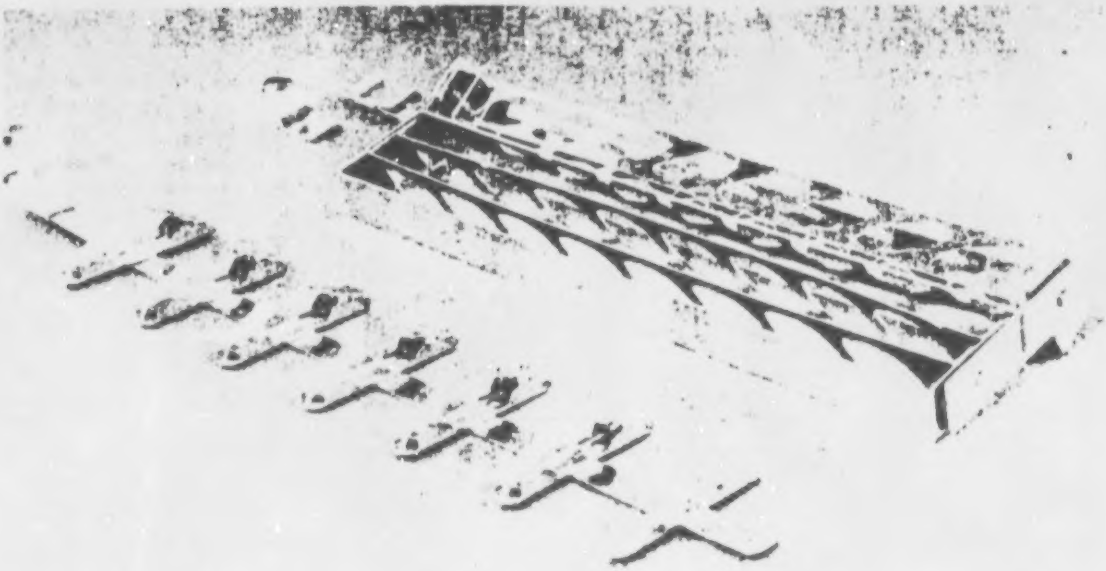
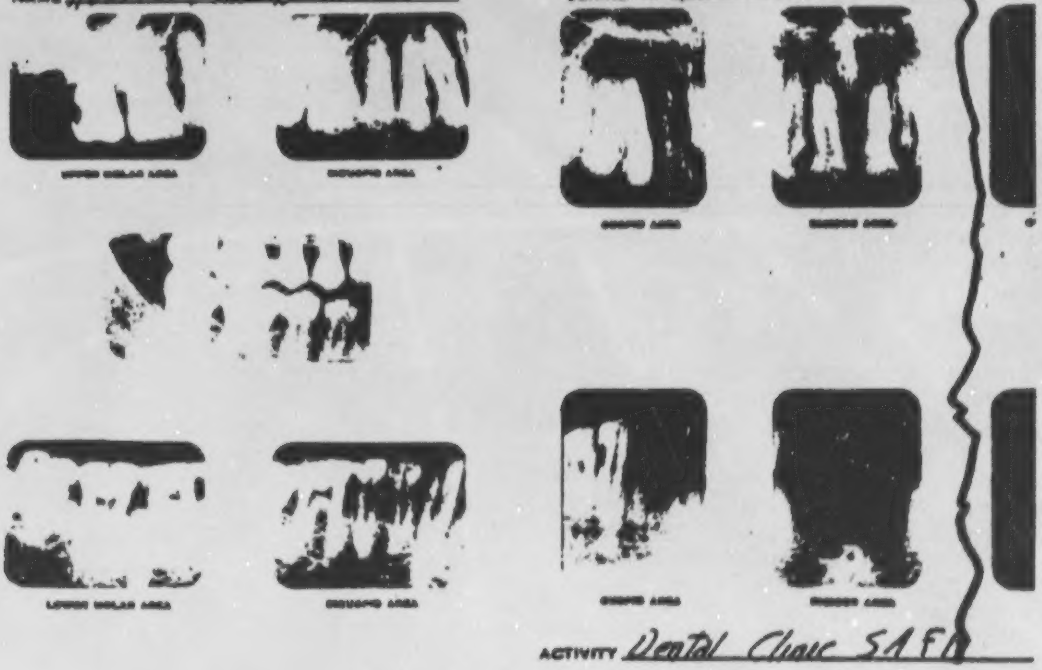


Figure 2-39. Film holders.



NAME HOUSTON, Thomas W.

SERIAL NO 440-28-2445 RANK OR RATE

ACTIVITY Dental Clinic SAFB

Figure 2-40. Mounted radiographs.

the processing of dental radiographic film by answering a series of key questions.

Time-Temperature Processing Technique. The procedures we discuss in this section apply to the manual processing tank and not the automatic processor. If you are using the automatic processor, follow the manufacturer's instructions. Several steps are necessary for processing radiographs using the time-temperature processing technique. The first step entails providing for the identification of the film.

Film identification. Since there are usually several processing racks in use in the darkroom at any given time, it is necessary to have some way of identifying which patient's films are on which rack. One way of doing this is to number each rack and assign a rack number to each X-ray patient. The patient's name and rack number may be recorded in an X-ray log book, or the number may be recorded onto the patient's AF Form 644, Record of Dental Attendance. After the films have been processed, they can be identified by matching the rack number to the patient number.

Film placement on racks. After you have provided for the identification of the film you are ready to start processing the film. The processing must, of course, be done inside the darkroom. To begin the processing procedure, remove the film from its packet and *securely* attach it to the film rack. If the film is not secured on the rack, it may fall off and sink to the bottom of the processing tank. Needless to say, retrieving film from the bottom of the tank is a difficult and messy task. Now the film is ready to be placed in the first processing solution—the developer.

Developing. Generally speaking, when radiographic films are placed in a developing solution, the surface tension of the film prevents the solution from fully contacting the film. You can see the results of this phenomenon in the form of tiny air bubbles, which appear to be attached to the film. When left uncorrected, portions of the film go undeveloped, which produces an inferior quality radiograph. To eliminate the bubbles and increase the quality of the radiograph, agitate the rack for a few seconds immediately after you place it in the developing solution.

The amount of time required for the developing of X-ray film depends on the temperature of the developer solution. The ideal time-temperature ratio of the developer used by the US Air Force is a developing time of 4 ½ minutes with the developer solution at a temperature of 68° F. However, variations are allowed. The following table indicates the amount of time that a film must be left in the developer solution at a certain temperature:

Temperature (Degrees Fahrenheit)	*Time (Minutes)*
60	6 1/2
65	5
68—Ideal	4 1/2
70	4
75	3

Since the time-temperature ratio is so critical when you process radiographic film, it is advisable to post the processing table in a conspicuous place in the darkroom for the convenience of all persons who may process film. When fresh developer solution is being used, it may be necessary to reduce the developing time by a minute or more. When the developer solution has been used for a period of time, it may be necessary to extend the developing time by a minute or more.

The developer solution is kept in the left-hand section of the processing tank. When films are placed in this solution, the silver halides in the film emulsion that were affected by the X-rays are converted to a black metallic silver. The unexposed silver halides are not affected by the developer solution. Since developing time is most critical, a floating thermometer should be kept in this section of the tank. Be sure to check the temperature of the developer before you begin film processing.

Developer that is too old, too exhausted, or too cold will not properly develop a film. The chemicals in a developing solution are gradually exhausted by use. Also, exposure of the solution to air, heat, or light will cause deterioration by oxidation. Therefore, keep the tank filled at all times, keep the solution cool, and keep the solution covered to protect it from light. New solution may be added to the tank from time to time to avoid an abrupt change in potency. However, depending upon the number of films developed, it will be necessary to renew the solution at intervals. If the developer has become a dark brown color, it should be discarded and replaced with fresh solution. The average length of time that the solution is effective in the dental clinic is about 2 weeks. Mix new solutions in accordance with their manufacturer's instructions.

Rinsing. The running water in the center section of the processing tank should be approximately the same temperature as the developer solution and the fixer solution. After the developing is complete, the film should be moved into the center rinsing section of the processing tank and agitated from 15 to 30 seconds for the purpose of rinsing off all traces of the developer solution. The water should be shaken from the film. Next the film must be placed in the fixer solution. The developer solution must not be carried into the fixer solution. Likewise, the fixer solution must not get into the developer solution.

Fixing. The fixer solution is kept in the right-hand section of the processing tank. It removes the unaffected halide salts and hardens the emulsion. Films should be briskly agitated when they are placed in the fixer solution and left there for approximately 10 minutes. All of the foregoing steps are accomplished in the darkroom with no light except the safelight.

Washing. From the fixer solution the films are placed in the water in the center rinsing section of the processing tank for washing. They must be washed for at least 20 minutes in running water. This will prevent a discolored film and also keep the fixer solution from dropping on the floor, where it forms an unsightly white spot.

Drying. Films must be thoroughly dried after they have been processed. The time involved depends on the humidity and circulation of air. Films should never be dried in a temperature exceeding 100° F, or near a source of heat such as a radiator, because such a practice results in curled film.

Exercises (640):

1. What is the purpose of numbering the X-ray film racks?
2. What is the first step of the processing procedure that must be done entirely in the darkroom?
3. What processing difficulty can result from the surface tension of the film and what should you do to eliminate this problem?
4. What is the ideal time-temperature ratio for developing dental radiographic film?
5. What portion of the processing tank contains the developer solution?
6. In what portion of the processing tank should the floating thermometer be kept? Why?
7. How does the developing solution affect the film?

8. When should the developing solution be discarded and replaced with fresh solution?

9. What should you do immediately after the interval timer has signaled that the film has spent its allotted time in the developer solution?

10. What portion of the processing tank contains the fixer solution?

11. How long should the films remain in the fixer solution?

12. After the fixing of the film has been completed, how long should the film be washed?

13. What is the maximum temperature at which films can be dried without danger of curling?

641. State the procedure for mounting radiographs, and given a list of anatomical landmarks, identify the radiographs on which they may be seen.

Mounting Periapical Radiographs. A full mouth radiographic series consists of 14 periapical and 2 bitewing films, which are usually mounted in a cardboard folder called an X-ray mount. (See fig. 2-40.) This permits convenient handling of the radiographs while viewing, and it facilitates filing. You should always mount the films for viewing from the lingual aspect, as though the viewer were sitting on the patient's tongue looking out of the mouth. The mounts have slots into which you slide the film. Place the film into the mount in the same sequence that the teeth appear in the mouth. You place the central incisor view in the center of the mount, a cuspid view on each side of the central incisor view, a bicuspid view distal to each cuspid view, and a molar view distal to each bicuspid view. Now that we know how the films are placed in the mount, let's see how we identify the various views.

The first step in mounting radiographs is determining the aspect from which you are viewing the film. As you should recall, there is an embossed dot located on one corner of the film. This dot appears as a bump on one side of the film and as a depression on the other side of the film. To properly mount the radiographs, you should be looking into the depression. Viewing into the depression provides the lingual aspect of the radiograph.

Next, we determine whether the radiographs are maxillary or mandibular views and which teeth are shown. Several anatomical features can aid us in making this determination. We have listed many of these features below:

a. The *maxillary sinus* is usually quite prominent on the maxillary cuspid, bicuspid, and molar views. It appears as a large darkened area above the root tips and is often inscribed by thin white lines.

b. The *nasal spine* can usually be seen on radiographs of maxillary central incisors. It appears as a white line, about one-fourth inch thick, which descends from the top of the film down to about the root tips. Darkened areas appear on each side of the nasal spine. These areas are the nasal passages.

c. The *maxillary tuberosity* can usually be seen on maxillary molar views. This tuberosity appears as a bulge of bone located distal to the maxillary third molar.

d. The *mandibular canal* can sometimes be seen on the mandibular molar and bicuspid views. This canal, when visible, appears as a dark line that begins in the third molar area and travels horizontally just below the root tips. Quite often small vertical extensions from this line to the apex of the tooth can be seen.

e. The *mental foramen* can usually be viewed on radiographs of the mandibular bicuspids. This natural opening in the bone appears as a dark dot, which is located slightly below the bicuspid teeth.

f. The anterior portion of the *ramus of the mandible* can often be seen on mandibular molar radiographs. Normally, you can see the inner angle of the mandible and a portion of the ramus as it ascends toward the temporomandibular joint.

g. In addition to the anatomical features we have mentioned, the teeth themselves often offer clues to the identity of the radiograph. For example:

(1) Maxillary incisors and cuspids appear larger than their mandibular counterparts.

(2) Maxillary molars have three roots, whereas mandibular molars have only two.

(3) The shape and position of the teeth differ.

After you have identified the radiographic view, your last determination is whether it belongs on the right or left side of the mount. This is a simple procedure. First, make sure you are viewing the film from the lingual aspect. Then arrange the films so that the teeth appear as they do in the mouth. For example, the bicuspid view also shows the first molar; this film should be placed in the mount so that the bicuspids are the closest teeth to the midline.

Exercises (641):

1. In what sequence and aspect should films be mounted for viewing?

2. How can you determine if you are viewing the radiograph from the lingual aspect?

In the exercise below write the anatomical feature or features listed in column B under the radiograph in column A on which they may be seen. Some items may be used more than once.

Column A	*Column B*
3. Mandibular bicuspids:	a. Nasal spine.
(1) ______.	b. Maxillary sinus.
(2) ______.	c. Maxillary tuberosity.
4. Maxillary central incisors:	d. Mental foramen.
(1) ______.	e. Mandibular canal.
5. Maxillary molars:	f. Ramus of the mandible.
(1) ______.	
(2) ______.	
6. Mandibular molars:	
(1) ______.	
(2) ______.	
7. Maxillary cuspid:	
(1) ______.	

8. List the characteristics of the teeth that can offer clues to the identity of a radiograph.

642. List the terms that relate to the visual quality of radiographs, and identify the causes of faulty radiographs.

Evaluation of Diagnostic X-Rays. You must be able to evaluate the radiographs that you take and determine whether they are of diagnostic quality or not. This does not mean that you will make a diagnosis. It means that you must determine whether the radiographs are of acceptable quality to aid the dentist in making a diagnosis. There are a number of things that you must consider when making your evaluation. Consider the visual quality of the image, and whether correct techniques were used for film placement, vertical angulation, horizontal angulation, projection of the central ray, exposure, and processing.

Visual quality of the image. Radiograph quality requires clear definition and maximum accuracy in the portrayal of the dental structures as they actually exist. The quality of the radiograph is determined by the sharpness of the image (detail); the degree of blackening of the film (density); and the difference between the black, white, and various shades of gray on the film (contrast).

Causes of faulty radiographs. Faulty radiographs result from many types of errors. Sixteen common classes of faults that can occur when you are exposing and processing radiographs are listed below:

a. Thin image, caused by:
  (1) Insufficient exposure or developing time.
  (2) Use of excessively cold or exhausted developer solution.
  (3) Use of diluted developer solution.
b. Dense image, caused by:
  (1) Too long exposure time or too long developing time.
  (2) Use of a too warm developer solution.
  (3) Use of a concentrated developer solution.
c. Partial image, caused by:
  (1) Film not completely immersed in the developer solution.
  (2) Film in contact with another film in the developer solution.
  (3) The center beam of the X-ray focused off the film in periapical films or off center in bitewing films so that it only exposes a portion of the film. The unexposed portion of the film is clear when it is processed. This error is called cone cutting.
d. Foreign image, caused by:
  (1) Eyeglasses, rubber dam clamps, removable partial dentures, amalgam in tooth sockets, metal in tissues.
  (2) Radiopaque objects in the X-ray unit cone.
  (3) Fingers interposed between the film packet and the cone.
e. Blurred image, caused by:
  (1) Movement of the patient, film, or X-ray unit head.
  (2) Double exposure.
f. Distorted image, caused by:
  (1) Film packet bent during exposure.
  (2) Improper angulation.
g. Fogged image, caused by:
  (1) Unintentional exposure of film to radiation because of improper storage.
  (2) Use of overage film that has been exposed to heat or chemical fumes.
  (3) Improperly mixed or contaminated developer solution.
  (4) Safelight screen bleached, thin, or cracked.

NOTE: Fog may be described as a dark gray appearance on the film, with a loss of detail and an absence of the contrasting light elements of the picture. (The radiograph lacks contrast or sparkle.)

h. Stained or streaked film, caused by:
  (1) Dirty solutions.
  (2) Unclean film holders or hangers.
  (3) Insufficient fixing or washing.

i. Black spots, caused by bending the film packet to the extent that the packet cracks open and admits light.

j. Fingerprinted films, caused by handling the films by flat surfaces instead of placing fingertips on the edges.

k. Reticulation, caused by carrying the film from a warmer to a colder solution or use of processing solution of over 75° F. Reticulation is a netlike appearance of the film. The film may appear to be covered with little globules.

l. Herringbone image, caused by placing the wrong side of the film packet toward the source of the X-rays. Instead of a herringbone image, some film will show the words "WRONG SIDE EXPOSED" when, in fact, the wrong side has been exposed.

m. Bleached image, caused by leaving film in a freshly mixed fixer solution for too long a time, especially at elevated temperatures.

n. Black areas on film, caused by discharge of static electricity, due to pulling a film from its paper wrapping too rapidly in a dry atmosphere.

o. Crescent-shaped lines, caused by damage to the emulsion resulting from sharp bending of the film packet.

p. No image obtained on the processed radiograph, caused by:
  (1) Electric plug not in, circuit breaker switch off, timer not lifted from hook, timer button not pushed down hard, or the voltage compensator indicator not on a contact point.
  (2) Film placed in fixer solution before being placed in developer solution.
  (3) X-ray unit head not making proper contact with electric current supply due to loose locking collar.

Exercises (642):

1. List the terms and their meanings that relate to the visual quality of a radiographic image.

Identify the causes of faulty radiographs by matching the cause in column B to the fault listed in column A.

Column A

___ 2. Distorted image.
___ 3. Herringbone image.
___ 4. Dense image.
___ 5. No image.
___ 6. Bleached image.
___ 7. Partial image.
___ 8. Reticulation.
___ 9. Foreign image.
___ 10. Thin image.
___ 11. Blurred image.
___ 12. Black areas on the film.
___ 13. Fogged image.
___ 14. Stained or streaked film.

Column B

a. Insufficient exposure or developing time.
b. Film left too long in freshly mixed fixer solution.
c. Improper angulation or excessive bending of the film packet.
d. Unintentional exposure of film to radiation because of improper storage.
e. Insufficient fixing or washing.
f. Using a solution over 75° F. or carrying the film from a warmer to a colder solution.
g. Placing the wrong side of the film packet toward the source of the X-rays.
h. Pulling the film from its paper wrapping too rapidly.
i. Placing the film in the fixer solution prior to the developer solution.
j. Movement of the patient, film, or X-ray unit head.
k. Not completely immersing the film in the developer solution.
l. Radiopaque objects in the X-ray unit's cone.
m. Too long a developing or exposure time.

CHAPTER 3

General Assisting Procedures

THE SAYING "It's not whether you win or lose that counts, but how you play the game" is one that should be remembered by all dental personnel. Since most patients do not have the educational background to judge the professional merit of the dental treatment, it is obvious that they must draw their conclusions from other factors. These factors are, fundamentally, how you and the other members of the dental staff participate to make their visits to the dental clinic as pleasant as possible.

As a member of the dental career field you are well aware that one of the prime responsibilities is providing assistance to the dental officer. To effectively provide this assistance, you must be knowledgeable of the fundamental assisting procedures. This chapter is devoted to professional standards and the fundamental assisting procedures.

3-1. Professional Standards

Strangely enough, most people do not acknowledge that members of the health care sciences possess human weaknesses. Instead, they consider them as rather sacred and associate them with the great television healers like Ben Casey, Joe Gannon, or Marcus Welby. They admire and respect the members of health care sciences, and rightfully so, as health care science is an admirable and respectable profession. The general public didn't get this impression by accident. It was earned through our observance of the standards set by our profession. These standards include our professional relations, behavior, and ethics. This section discusses these standards and the legal implications of the dental health team.

643. State the purpose for the professional standards required within the dental service and given a list of actions, identify those that could result in legal implications.

Professional Relationships. Basically professional relations are no different than the human relations we have already discussed. You obtain these relations by fulfilling the psychological needs of your patients and coworkers. As you recall, these needs include security, recognition, affection, and achievement. Having good relations with your coworkers and patients promotes a feeling of harmony. It makes your job more enjoyable and results in a smoother running, more reputable dental service.

Behavior. Certainly behavior relates to professional standards. You are working in a professional atmosphere, and anything you do to distract from that atmosphere degrades your profession. Patients come to the dental clinic for treatment by professionals—don't let them think you are anything less. Even witnessing harmless "horseplay" can have a negative effect on a patient who is in pain or who is apprehensive. Abusive or offensive language has the same effect. Always refrain from any unprofessional actions in patient areas. This includes the reception area and waiting room since this is where the patient forms his first impression. Also remember the white uniform you wear differs from fatigues as it identifies you with the medical services. Your behavior when in whites should be such as to make your profession proud.

Professional Ethics. Just as physicians and dentists have a code of ethics so do dental assistants. The following code of ethics was formulated by the American Dental Assistants Association (ADAA). It applies to both military and civilian dental assistants. Study it carefully.

> The spirit of the Golden Rule should be the guiding principle of conduct for the dental assistant. In all your contacts with the dental profession and society you should maintain honesty, loyalty, and desire to serve to the best of your ability, your dentist, your organization, and our patients.
>
> You should give to your dentist and your organization the cooperation they need to serve our patients capably and efficiently. You will hold in confidence the details of professional service rendered by your dentists. You should refrain from performing any service for patients which requires the professional competence of the dentist, or which may be prohibited by applicable dental practice acts of the state in which employed.
>
> You should avoid making any disparaging remarks about the conduct of the profession you serve or your dentist's treatment of his patients.
>
> You have the obligation of increasing your skill and

efficiency by availing yourself of the educational opportunities provided by the American Dental Assistants Association and its component societies. You should take part in the efforts of these groups to improve the educational status of the dental assistant and should support this Code of Ethics.

Legal Implications. Laws established by the American Dental Association and the State Dental Practice Acts provide for the legal practice of dentistry. Since the dentist is licensed and you are not, he is legally responsible for patient treatment. This,. however, does not relieve you of your responsibility. You must be aware of these legalities to prevent compromise of the existing laws. Let's look at some legal complications in which you could be involved.

Performing unauthorized services. Each state has a Dental Practice Act, which authorizes the allowable duties of civilian dental auxiliaries. These duties vary from state to state. For instance, auxiliaries may not be allowed to expose radiographs by one state but may be authorized to by another state. Military dental assistants are not limited by the Dental Practice Act while performing duties on a military installation. Your duties are, however, summarized in AFM 39-1, *Airman Classification Manual.* These duties as they appear in AFM 39-1 can be found in Volume 1, Chapter 1, of this CDC. You must know your legal restrictions and not surpass them, regardless of how qualified you feel.

Leaving patients unattended. You have probably seen patients experience syncope or drug reactions and fully realize why patients shouldn't be left unattended. Nevertheless, this cannot be overemphasized. If the dentist leaves the treatment room, be sure you stay with the patient. Patients who are injured by falls or medication reactions while unattended could file and probably win a lawsuit.

Privileged communications. In your work you are exposed to much information that is considered privileged communication. The best way to avoid violating privileged communication is to simply refrain from talking about your patients. Health histories may reveal that Mrs. X has had a breast removed or Sergeant Y has had a venereal disease. This is nobody's business but yours, the dentist's, and the patient's. Don't spread it around, as it is privileged communication. Even discussing a patient's routine treatment with someone without a need to know must be avoided. Keep the business of the treatment room in the treatment room.

Prescribing treatment. Many times patients will ask you what treatment the dentist is going to perform. Although it seems harmless enough to tell him, it can result in complications. For instance, you tell a patient the dentist is going to restore a tooth; then the dentist examines the radiograph and informs him that the tooth must be removed. Now the patient has two conflicting treatment plans. Which one is right? The patient could feel the dentist is extracting a tooth that could be saved and bring legal action against him. For this reason you should refrain from telling the patient too much. Refer him to the dental officer for the exact treatment plan.

Equipment maintenance. If a patient is injured because of faulty equipment, the dentist may be charged with negligence. Since the maintenance of equipment is your responsibility, you must be sure everything is working properly. Pay particular attention to X-ray units and operating lights which could fall and injure the patient.

Sterilization. The use of unsterile technique can result in liability. The dentist relies on you to properly sterilize his instruments and to help him avoid patient contamination. There is no excuse for shortcutting sterile techniques. You must observe the proper sterilization procedures and frequently check your sterilizers to make sure they are operating properly.

Drug administration. Use of a wrong drug which results in injury is also negligence. This could result if you give the dentist the wrong drug or have drugs without labels or with improper labels in the treatment room. When passing a drug to the dentist, you should tell him what drug you are giving him. This final check helps prevent the administration of wrong drugs. There is no excuse for unlabeled drugs. It takes only a few minutes to make a label for medication bottles, and these few minutes could prevent injury to a patient.

Exercises (643):

1. What is accomplished by establishing good professional relationships with patients and coworkers?

2. How can you obtain good professional relationships?

3. Why should you refrain from horseplay in the patient areas of the dental clinic?

4. What should be used as the guiding principle of conduct for the dental assistant?

5. Identify each action that could result in legal implications by placing a checkmark next to the action.

___ a. Seating the patient in an uncomfortable position.

___ b. Leaving a medicated patient unattended.
___ c. Telling the patient what treatment the dental officer is going to perform.
___ d. Mixing materials according to manufacturer's instructions.
___ e. Shortcutting sterile techniques.
___ f. Discussing the patient's health history with the dentist.
___ g. Underexposing a radiograph.
___ h. Administering the wrong drug.

3-2. Fundamental Assisting Procedures

During your career, you may assist several different dental officers. You may further assist in several or all of the dental specialties. In doing so, you will find dental officers do not always carry out procedures in the same way. Dental officers generally follow a similar pattern, but because of individual preferences and variations in professional training, each performs somewhat differently. Consequently, you must learn the favorite instruments, medications, and procedural routines of each dental officer you assist. Even though there are variations in treatment routines, there are fundamental assisting procedures and knowledges you need to be an effective dental assistant. This section discusses these procedures and knowledges.

644. Answer pertinent questions about the procedures involved with receiving the patient.

Receiving the Patient. The importance of how you receive the dental patient cannot be overemphasized. Your personal actions and reactions help to create an impression in the mind of the patient. Creating a good impression aids in patient treatment, whereas an undesirable impression hinders dental treatment. To be sure, you will influence the dental patient. Naturally, your aim should be to exert influence toward aiding the treatment each patient is to receive.

As we mentioned earlier, a few careless words or actions on the part of the assistant can completely destroy a favorable image the dental patient might hold concerning the Air Force dental service. As a dental specialist, you are constantly under the scrutiny of the "public's eye." How you talk, walk, dress, and perform are noticed by the public. It is, therefore, imperative that you always guard against creating possible adverse impressions and publicity, especially when you receive patients. There are three functions involved with receiving patients. First, you must make preparations for the patient; next, you greet the patient; and, finally, you seat him in the dental chair.

Preparation. Since patients are apprehensive when they appear for a dental appointment, they are more acutely aware of the appearance and cleanliness of the treatment room when they first enter. Therefore, in preparing the treatment room, it is important to carry out certain procedures. Clean and disinfect the dental unit and other dental cabinets, work surfaces, arms of chairs, and lamps with an alcohol sponge. Clean the cuspidor of debris and blood, since this is the area a patient observes when he expectorates. All paperwork should be stored in cabinets or desks. The medicaments and instruments should also be neatly arranged with as few exhibited as possible. Apprehensive patients dislike viewing instruments and medications. Make sure that hand towels are clean and neatly arranged. Place the standard diagnostic instruments (mouth mirror, explorer, and cotton pliers) on the bracket table along with a clean saliva ejector.

Once you have the treatment room ready you should review the patient's dental health folder. Your review should determine the following:

- If the record is complete.
- If information is current.
- If you have the correct record for the patient being treated.
- If positive responses on the dental patient history forms are indicated on the outside of the folder.

Should you find that the contents of a dental folder are incomplete or noncurrent or that you have the wrong record for the patient being treated, do what you can to correct such conditions. Should you further find that there is a positive response to any question of the patient's history form (AF Form 696), bring this to the attention of the dental officer. In fact, all discrepancies noted in a dental folder should be brought to his attention. In doing so, however, be sure you point out these discrepancies before the patient is seated or in a way that will not cause the patient undue alarm.

Greeting. Now that you have made the necessary preparations, you are ready to receive the patient. Whenever possible, walk to the waiting room and greet the patient pleasantly by his name and rank. Do your best to call out the correct rank and to pronounce the patient's name correctly. Failure in either instance can irritate the patient and be embarrassing to you.

In some dental clinics a clinical intercommunication sound system is used to direct patients to the treatment rooms. If this system is used in your clinic, be sure to greet the patient at the door of the treatment room. Regardless of the system used, be sure to greet each patient pleasantly by name and rank. Also, be sure to notify the scheduled patient if there is reason to believe he may not be treated at the scheduled time. Failure to do so tends to irritate the best of patients.

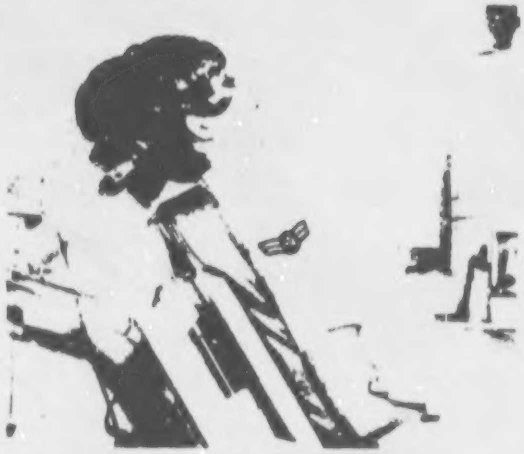
Should you walk to the waiting room to call the patient, or should your dental officer refer a patient to another section, it is good practice for you to escort the patient. In doing so, you can use light conversation to good advantage. Such action helps to relieve the patient of possible apprehension concerning the dental treatment he is to receive. The weather or the patient's hobbies are good subjects for such occasions. Avoid subjects which could cause a controversy between yourself and the patient.

Seating. Immediately preceding the seating of the patient, you should relieve him of anything that might possibly interfere with his treatment. For example, items such as spectacles or a coat should be removed and placed in an out-of-the-way area. Some dental officers prefer to seat the patient and adjust the chair at this point. Most, however, expect you to seat the patient.

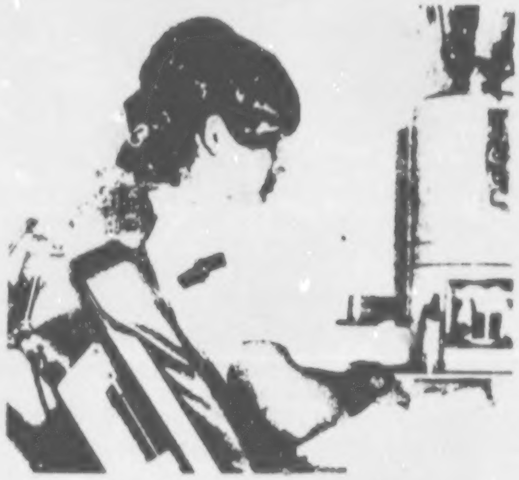
The main idea is to seat the patient as comfortably as possible, since the comfortable individual makes a better patient. An uncomfortable patient cannot relax. To seat the patient with ease, the chair should be lowered to its lowest position and the engine arm along with the bracket table should be swung out of the way. If the treatment room you work in is equipped with a chair having an adjustable backrest and headrest, you should have previously set them for the average patient before attempting to seat each patient. Further adjustments may then be made much more easily and seemingly more accurately. You should stand behind the chair as the patient is seated and make the necessary adjustments right away.

There is no one seated position for the patient that is suitable for all dental operations. The correct patient position varies because of the arch (maxillary or mandibular) being treated, because of the training of the dental officer you assist, and because of the nature of the treatment to be accomplished. A good rule to follow is to have the occlusal plane of the patient's mandibular teeth parallel with the floor when his mouth is open. If you are in doubt about the correct patient position, ask your dental officer. Figure 3-1 shows the correct and incorrect positions of a patient in a dental chair.

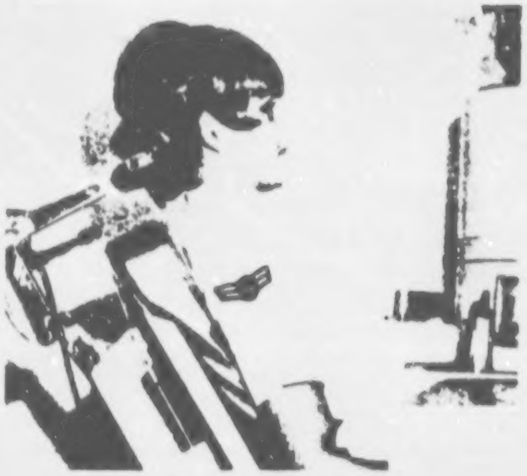
Most or all of the patient seating procedures may be completed before the dental officer enters the treatment room. When this is the case, you should continue to maintain light conversation with the patient. If the patient asks questions about his particular treatment, you may answer them if they are within your realm of responsibility. Be extremely careful not to commit the dental officer to a treatment plan he cannot fulfill. *Do not* attempt to impress patients with your knowledge about dental professional matters. Questions about the professional aspects of patient treatment are to be referred to and answered only by the professional



Head Too Far Back
A



Head Too Far Forward
B



Correct Position
C

Figure 3-1. Patient positions.

.369

dental officer. It is further important that you *do not* leave the patient unattended at any time during the course of a treatment procedure. Instead, you should observe the patient and bring abnormal responses (pale, flushed, or clammy skin, etc.) to the immediate attention of a dental officer.

Exercises (644):

1. What are the three functions involved with receiving patients?

2. What should be used to clean and disinfect the dental unit, cabinet, chair arms, and the dental lamp?

3. What instruments should be placed on the bracket table during the preparation phase? What should be done with the other instruments?

4. What should you determine by your review of the patient's dental health folder?

5. When should you bring discrepancies you find in a patient's health record to the attention of the dental officer?

6. Whenever possible, how should you greet the patient?

7. Where should you greet the patient if you use the clinic's intercommunication system to direct the patient to your treatment room?

8. What topics are acceptable for conversation when escorting a patient?

9. How should the dental chair be positioned before you attempt to seat each patient?

10. What tooth plane should be parallel to the floor when you have the patient seated?

11. What should you do after you have seated the patient and are waiting for the dental officer to enter the treatment room?

645. List two procedures for draping dental patients; state the purpose of each, and briefly describe each procedure.

Draping the Patient. After you have the patient in a comfortable preoperative position, he is ready for draping. There are normally two types of patient drapings used in the dental clinic. They are the routine drape and the surgical drape. The type of drape selected depends on the procedure to be done and the preference of the dental officer.

Routine drape. The primary purpose of the routine drape is to protect the patient's clothing. It is used for procedures with a low contamination probability. The routine drape is the most commonly used draping procedure. Linen, paper, and plastic-backed paper towels are commonly used patient drapes. They are held in position by a towel chain, which is put around the back of the patient's neck. When using the plastic-backed paper napkin, be sure the paper side faces outward. This allows spilled liquids to be absorbed rather than to run down the plastic onto the patient's clothing. Some clinics use a plastic apron that covers the anterior surface of the patient's torso to the knees. This apron is particularly useful for protecting the patient's clothing when the cavitron is being used.

Surgical drape. The surgical drape is used when contamination is a prime consideration. It has a threefold purpose. First, it prevents an apprehensive patient from seeing instruments that might further aggravate his tensions. Secondly, it prevents the bright operating light from shining into the patient's eyes. Finally, since the Mayo or instrument stand is customarily located behind the patient, the surgical drape will prevent the accidental contamination of the instruments with the patient's hair. Using sterile towels, apply the surgical drape in the following manner:

- Have the patient lift his head from the headrest.
- Lay two hand towels across the headrest, taking care not to contaminate your gloves.
- Have the patient lay his head back on the towels.
- Crisscross the top towel across the eyes and head and secure it in place with a towel clamp.

Allow the bottom towel to drape naturally around the neck and shoulders of the patient. Finally, cover the patient's chest with a drape and secure it at the back of the neck to the bottom head drape towel with a pair of towel clamp forceps. When you have properly draped a patient, everything in the operative field will be covered except the nose, mouth, and chin.

Exercises (645):

1. Name the two draping techniques used for dental patients.
2. What is the primary purpose of the routine drape?
3. What is used to hold the towel in position for the routine drape?
4. If the plastic-backed paper napkin is used for the routine drape, which way should the napkin's paper side be placed? Why?
5. When is the plastic apron particularly useful?
6. When is the surgical drape used?
7. What three purposes does the surgical drape fulfill?
8. Briefly describe how the surgical drape is applied.

646. List two methods of preparing dental instruments for use, state when each method is preferred, and briefly describe the preparation procedure for each.

Select and Arrange Instruments. After the dental officer has determined what procedure is to be performed, you must furnish him with the necessary instruments. You must, of course, know what instruments the procedure requires and the ones the dentist prefers. Instruments should be arranged in their sequence of use; this eliminates having to search through all the laid out instruments for the one you want. Although many assistants merely lay the needed instrument on the bracket table, some dentists prefer that you go a step further and use instrument packs or tray setups.

Packs. Although instrument packs are primarily used in oral surgery, they are often used in periodontic, endodontic, and restorative dentistry. The pack consists of a series of instruments and supplies, which have been wrapped in a cloth wrapper and sterilized as one unit. The contents of the pack are planned so that almost everything needed for a specific operation is available in the pack. Medications and instruments that could be harmed by sterilization cannot, of course, be included in the pack. An example of this would be a dental handpiece. The use of packs results in a saving of time and energy, because you do not have to gather the needed instruments and supplies one at a time.

Setup trays. Trays are similar to packs as they also contain most of the supplies and instruments for a specific operation. Although packs have the advantage of not needing much storage room, setup trays allow you to prearrange instruments in their using sequence. A typical setup tray includes a corrosion-resistant and autoclavable tray (sometimes compartmented) in which the instruments and supplies are placed. The contents are usually covered with a cloth towel, surgical wrapper, or a suitable metal cover or lid. The entire tray, contents, and cover are then autoclaved as a unit. Setup trays are quite popular in the restorative section.

When preparing packs or setup trays, write their contents on a piece of autoclave tape, and affix this tape on the outside. After sterilization has been completed, write the date that the contents will no longer be considered sterile on the tape. Failure to label the packs or setup trays would cause you to have to open each one until you find the instruments you need. Normally, you do not need to list all of the contents on the label. It is sufficient to identify the contents by the procedure they are to perform. For example, silicate setup, amalgam setup, impacted mandibular third molar setup, gingivectomy setup, etc. Additionally, be sure that all instruments you place in the pack or on the setup tray are in good condition. Dull chisels, severely scratched mouth mirrors, and forceps or scissors with stiffly operating hinge joints should be remedied before you place them in the pack or setup tray.

Exercises (646):

1. What must you know in order to select the instruments for a specific procedure?

2. List two ways in which you can prepare instruments for use.

3. How should you arrange instruments if you place them on the bracket table or in setup trays?

4. Where are instrument packs primarily used?

5. What advantage do setup trays have over instrument packs?

6. Describe the typical setup tray.

7. How should setup trays or packs be dated?

647. State the purpose of local anesthetics and given a list of specific items and procedures, identify their purpose.

Preparing the Local Anesthetic. Prior to performing a painful dental procedure the dental officer injects the patient with a local anesthetic. The anesthetic functions to render the operating site insensitive to pain. The procedure may then be performed without causing undue pain or discomfort to the patient. Your role in administering local anesthetics lies primarily in making preparation for the injection. This includes preparing the syringe and other items used prior to and during injection.

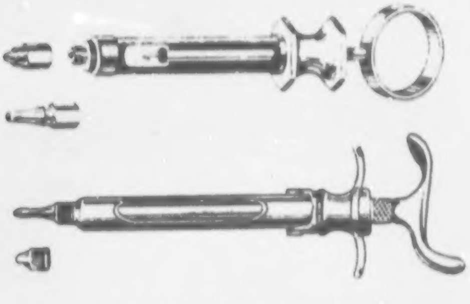


Figure 3-2. Anesthetic syringes.

Preinjection items. Before anesthetic injection, the dentist usually prepares the injection site. The preinjection items include an antiseptic solution, a topical anesthetic, cotton-tipped applicators, and 2- by 2-inch gauze sponges. A gauze sponge is used to dry the injection site mucosa prior to the application of the antiseptic and the topical anesthetic. After he has dried the injection site, the dental officer uses a cotton-tipped applicator to paint the area with an antiseptic solution. Metaphen is a topical antiseptic that is commonly used. Next, he will use another cotton-tipped applicator to apply the topical anesthetic. The topical anesthetic is usually supplied as an ointment. It is applied to reduce the pain associated with the injection of the needle. Your function during these preinjection procedures consists of preparing the materials for use and passing them to the dental officer as he requires them.

Injection items. The injection items used in administering local anesthetics include a syringe, a needle, and an anesthetic carpule. There are different types of each of these items available for use in the dental clinics. Therefore, it is important that you know each type and prepare the desired combination for use by your dental officer.

The *dental injection syringes* are available in two types—the aspirating and nonaspirating types. (See fig. 3-2.) The aspirating syringe (top of fig. 3-2) is equipped with a small harpoon on the plunger and a thumb ring handle. These two characteristics make it easily identifiable and serve to fulfill an aspirating function. This function enables the dental officer to determine whether or not the needle tip is located in a blood vessel before he injects the anesthetic solution.

The aspirating function is made possible by the harpoon engaging the rubber stopper located in the anesthetic carpule. Once the harpoon is embedded in the rubber stopper, the dental officer may then apply inward or outward pressure on the stopper by placing his thumb in the thumb ring handle and exerting either inward or outward pressure. Exerting outward pressure produces an aspirating (suction) effect whereas inward pressure forces the anesthetic solution through the needle. This quality enables the dental officer to fulfill the requirement of assuring that anesthetic solutions are not injected into blood vessels.

The aspirating syringe is presently more commonly used than the nonaspirating syringe. Loading the carpule (cartridge) into the aspirating syringe is fairly easy to do. These syringes are either

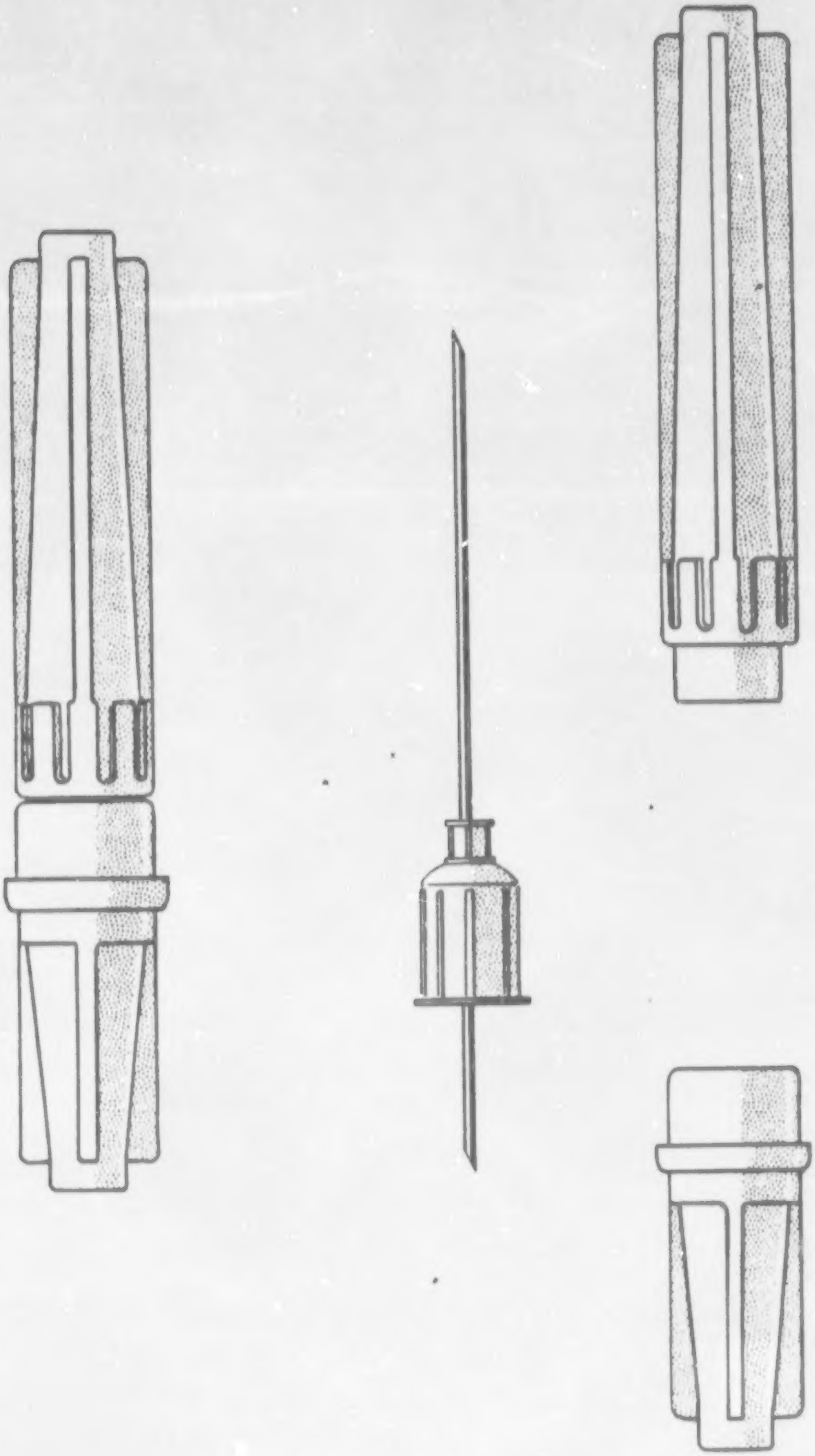


Figure 3-3. Injection needles.

the side- or top-loading type. The side-loading type is loaded by pulling the plunger against the top part of the syringe body, which allows the cartridge to be placed into the slot provided in the body part of the syringe. The top-loading type is loaded by turning the top, threaded portion of the syringe in a clounterclockwise direction. This action removes the top and makes the body part of the syringe ready to receive the cartridge. To complete the loading procedure, the threaded top portion is reattached to the syringe. On both the top- and side-loading syringes the harpoon is embedded into the loaded cartridge by holding the body portion of the syringe with one hand while you lightly tap the top of the handle with the other hand. CAUTION: Do not tap the handle with too much force since this might cause the glass cartridge to shatter. Until you gain experience in this regard, it is good policy for you to wrap a towel around the body portion of the syringe to prevent possible injury from shattered glass. Be sure you use a sterile towel.

The nonaspirating syringe (bottom of fig. 3-2) is basically the same as the aspirating type, with two exceptions. These exceptions are that the nonaspirating syringe plunger is absent from the harpoon, and the handle is the crutch type. Nonaspirating syringes are also designed in the top- and side-loading types.

Almost all *injection needles* used by the Air Force dental service are the disposable type. (See fig. 3-3.) For this reason, we limit our discussion to the disposable type. These disposable needles are available in a variety of gauges and lengths. Those listed in the *Federal Supply Catalog* are in either $^{13}/_{16}$- or $1^{7}/_{8}$-inch lengths, and both lengths are available in either 25- or 27-gauge openings. All of the disposable needles arrive in individual, sealed, plastic, capsulelike containers and also in a presterilized condition. Further, each of these needles is equipped with either a plastic or aluminum alloy hub designed to screw onto the threaded end of the syringe. This hub is positioned to permit the needle to extend inward to penetrate the rubber seal portion of a loaded anesthetic cartridge and outward for injection into the patient. The plastic that encapsulates the sterile needle is easily slipped from both ends of the hub. When you place a needle onto the syringe, remove only the capsule part which covers the syringe portion of the needle. In this manner, you maintain the sterility of the needle portion used to inject the patient until it is needed.

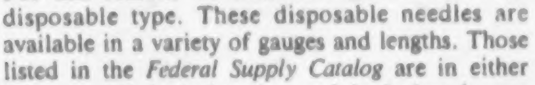


Figure 3-4. Anesthetic carpule.

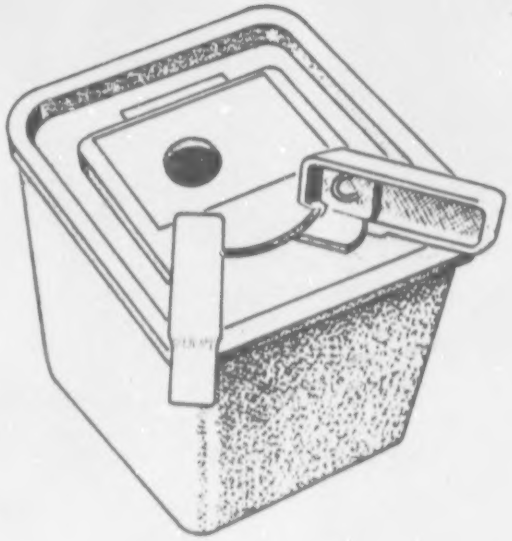


Figure 3-5. Needle destruction unit.

Several different anesthetic cartridges are found in Air Force dental clinics. They are lidocaine hydrochloride, 2 percent, with epinephrine 1:100,000; lidocaine hydrochloride, 2 percent with epinephrine 1:50,000; mepivacaine hydrochloride, 2 percent, with levonordefrin as a vasoconstrictor; and mepivacaine hydrochloride, 3 percent, without a vasoconstrictor. Each of the four types is sealed in 1.8 cc glass cartridges or carpules. The needle end of each cartridge is sealed with a rubber membrane, which is held in place by a metal band. The other end is sealed with a rubber stopper. There is a color difference in the rubber stoppers used in each different type of anesthetic. As you gain experience, you will be able to distinguish each type of anesthetic by these color differences. Figure 3-4 shows an anesthetic carpule. Having considered the necessary parts, let's see how they are assembled to make ready for an injection.

The dental officer will notify you as to which type of anesthetic he desires to use, which syringe, which needle he will use, and whether or not he will use a topical anesthetic. As a general guide, the following steps should be observed in preparing for an anesthetic injection:

(1) Place on the bracket table, as indicated, the antiseptic solution, the topical anesthetic, two sterile cotton-tipped applicators, and a sterile 2- by 2-inch gauze sponge.

(2) Once you know which type of anesthetic, syringe, and needle the dental officer desires to use, you may assemble them for the injection while the dental officer andministers the antiseptic and the topical anesthetic.

To assemble these items, you should, first of all, make all assembling and handling procedures out of view of the patient. You are expecting to (1) place the needle on the syringe (usually a short needle for maxillary injections and a long needle for mandibular injections), (2) load the cartridge, (3) embed the harpoon in the rubber stopper (when using the aspirating type syringe), and (4) force a small but visible amount of anesthesia through the needle to assure that all things are in readiness for the injection. Guard against contaminating the patient with infectious microorganisms by using properly sterilized syringes, needles, and anesthetic cartridges. The syringes and needles should have been autoclaved or sterilized with dry heat, whereas the anesthetic cartridges should have been stored with the metal-banded end pointed downward in a 70-percent isopropyl alcohol solution. You should continue to guard against possible contamination by keeping the plastic needle covering in place until you pass the syringe to the dental officer. Naturally, this cover must be removed to test for proper operation of the syringe and during the injection but should then be returned to its protective position. After each patient has been dismissed, you should bend and break or cut the needles to prevent further use. A destruction unit is available for disposable syringes and needles. You simply insert the needle into the unit's small orifice and squeeze the handles on the unit with a fast squeezing action. (See fig. 3-5.) This shears the needle off at its hub so that it may not be reused.

Exercises (647):

1. What is the purpose of administering a local anesthetic?

In items 2 through 14 identify the purpose of the specific item or procedure listed in column B with the item or procedure listed in column A.

Column A	*Column B*
____ 2. Short 13/16-inch needle.	a. A commonly used topical antiseptic.
____ 3. Nonaspirating syringe.	b. Used to dry the mucosa at the injection site.
____ 4. Gauze sponge.	c. Needle usually used for maxillary injections.
____ 5. 1.8 cc glass carpules.	d. Used to apply the antiseptic or topical anesthesia.
____ 6. Metaphen.	e. Used to reduce the pain associated with the injection of the needle.
____ 7. Cotton-tipped applicators.	f. Contains the anesthetic.
____ 8. Topical anesthetic.	g. Makes aspiration possible.
____ 9. The syringe's harpoon.	h. Employed to prevent reuse of the needles.
____ 10. Tapping the syringe's handle.	i. Assures that anesthetics are not injected into the blood vessels.
____ 11. 70-percent isopropyl alcohol solution.	j. Epinephrine and levonordefrin.
____ 12. Vasoconstrictors.	k. Embeds the harpoon into the rubber stopper.
____ 13. Destruction unit.	l. Characterized by a crutch-type handle.
____ 14. Aspiration.	m. Anesthetic carpules should be stored in this.

648. Indicate the knowledges and procedures required to properly pass instruments and materials by answering a series of key questions.

Pass Instruments and Materials. One of the most important duties of the chairside assistant is the passing and receiving of instruments and materials. To perform this task you must know the routine of the procedures and the related instruments and materials required. This enables you to anticipate the dentist's needs and allows you to fulfill these needs without unnecessary delays. The position you work from is dependent on the desire of the dentist and the arrangement of the treatment room.

Pass and receive instruments. Let's assume that you are standing on the left side of a patient who is being treated by a right-handed dentist. In most cases, you remove one instrument from the dentist's right hand and place the next needed instrument in his hand when given a signal. The signal may be a spoken word, a slight to moderate movement of his hand away from the patient's mouth, or only a pause in using the instrument. As the dentist gives his signal, you should remove the working instrument and pass the next needed instrument with the working end pointed toward the treatment area.

To begin the passing routine, you normally hold the instrument with your left hand in the position where the dentist may grasp it with his working hand without movement of his working hand. Do not release your grip until the dentist has firmly grasped the instrument. The dentist will signal that he has finished with the working instrument and desires the next instrument. The instrument exchange and placement differs with various dentists; therefore, you should ask how the dentist would like to receive and exchange instruments. When you assist from the right side and in front of the patient, you use your right hand in the same manner as described for the left hand above.

Prepare and pass materials. Dental material must be prepared at the proper time. A material mixed too soon does not allow sufficient handling time. For example, an impression material mixed before the dentist is ready for it may harden or set in the impression tray before it can be placed in the patient's mouth. On the other hand, a delay in mixing an impression material on your part tends to irritate the dental officer in addition to wasting time. Similar results occur when there is a premature or delayed mixing of other dental materials. Therefore, knowing when to mix is equally as important as knowing how to mix. As with instruments, knowing the routine of the procedure allows you to anticipate when the dental officer will need the specific materials. You should have the mixing equipment ready and the material proportioned slightly prior to the time they are needed. Begin mixing only when you know the dental officer is ready.

When you are assisting during an amalgam restoration, you load the amalgam into the amalgam carrier and pass the loaded carrier to the dental officer. You may sometimes use two or more amalgam carriers, which enable you to fill the barrel of one while the dental officer is using the other. Of course, you must also pass condensing instruments during the amalgam restoration process. During the use of silicate and zinc phosphate cements, most dental officers prefer that you leave the mixed cement on the glass slab and then place the glass slab in an accessible place (on bracket table or on mobile cabinet top) or hold the slab with your hand. He is then able to select the amount he desires for placement in the patient's mouth. The overall idea in passing and receiving dental instruments and materials is to have the needed item at the right place, in the right position, and at the right time. In doing this, the dental officer is then free to concentrate more on the area of treatment.

Exercises (648):

1. What knowledges must you have in order to adequately pass instruments and materials?

2. What signals might the dental officer use to indicate he needs the next instrument?

3. How should you place the working end of the instrument you are passing?

4. What knowledge concerning materials is equally important as knowing how to mix?

5. What is the overall idea in passing and receiving dental instruments and materials?

649. State the purpose of retraction, list the instruments used, and indicate how much pressure should be applied when retracting tissue.

Retract Tissue. During many dental procedures, there is a need to retract oral tissues. Retraction is normally performed to give the dentist easier operating accessibility, to allow a better view of the operation site, and to protect the tissues being retracted. The tongue, cheek, lips, and gingiva are tissues which must often be retracted. As you recall, the Thoma 1 and 2 retractors are helpful in retracting gingival flaps and the Seldin #23 and Molt #9 periosteal elevators may be used on gingival flaps and other oral tissues. The mouth mirror is very effective and is widely used to retract the tongue, cheeks, and lips. There are several medical-type retractors and a few of this type are sometimes used to retract oral tissue.

The main idea in retracting oral tissues is to firmly hold the tissue concerned out of the way to permit better viewing and access to the operation site, and to protect the tissue being retracted. For example, the gingival tissues covering an impacted molar must be retracted to give visual and instrument access to the operation site. For another example, the tongue can become very unruly in some patients and must be protected from possible harm by rotating burs and other instruments. Likewise, sometimes the cheeks must be retracted for protection, as well as to permit access to certain areas of the mouth. During surgical operations to remove salivary stones from the sublingual glands, you may need to retract a flap of the oral mucosa with one hand and manipulate an aspirator tip with the other. In such cases, the dental officer may also need to retract the tongue with one hand and perform the operation with the other. Whatever the case may be, remember to retract the tissue firmly enough to prevent slippage but not so firmly as to cause unnecessary tissue bruises and trauma. An unfirmly applied retractor tends to result in slippage and unnecessary tissue damage.

Exercises (649):

1. State the purposes of retraction.

2. List the instruments that are used to retract the various tissues.

3. How much pressure should you apply to the tissue you are retracting?

650. State the purpose of irrigation and aspiration, list the irrigation medias; and given a series of descriptive statements, differentiate between the types of irrigation and aspiration equipment.

Irrigation and Aspiration. The job of irrigating the oral cavity is yours for the most part. By applying water or saline solutions to operating areas in the oral cavity, you bring small tooth particles, dried blood, and other debris into solution so that these materials can then be removed by aspiration. This leaves a clean field of operation for the dental officer. The use of handpieces with a water spray system has eliminated much of the need for irrigation by the dental assistant during restorative procedures. Sometimes, however, the dental officer may need additional irrigation, or he may elect not to use the water spray system for a particular procedure. If this is the case, use the dental unit mounted water syringe to irrigate the operative site.

When you irrigate operation sites during surgical procedures, you normally use a sterile saline solution or sterile water as the irrigation medium. You may apply these fluids by using either a bulb-type or Luer (piston-barrel) syringe. The main purpose for irrigation during surgical procedures is to maintain a clean field of operation. The cleansing is not completed, however, until the irrigating solution is aspirated (drawn by suction) from the mouth.

Aspiration is necessary to remove blood, pus, saliva, and debris from the field of operation and the oral cavity. This is accomplished in one of three ways in Air Force dental clinics: by using the saliva ejector, the oral evacuator, or the Gomco aspirator. When using any of these aspirators, always place their tip in the upright position before turning them off. This helps prevent the clogging of their hoses by materials that have passed completely through.

Saliva ejector. Your role in using the saliva ejector is primarily to assure that a sterile saliva ejector tip is in place for each patient. The saliva ejector is used when the aspirating requirement is mostly limited to removing saliva from the patient's mouth. The saliva ejector does not have enough suction power to remove large volumes of solutions from the oral cavity. This aspirating device is widely used, however, to remove salivary secretions after the cavity has been prepared and during the placement of filling materials in the cavity preparation.

Oral evacuator. The oral evacuator is generally described as a high-volume, low-pressure suction apparatus. That is, the oral evacuator is capable of removing a high volume of fluids from the oral cavity and yet does not exert injurious suction pressure to oral soft tissues. These qualities make the oral evacuator almost the ideal suction apparatus for removing the relatively high volume of fluids that accumulate during cavity preparation. Your role in handling the oral evacuator is frequently to manipulate the suction tip, to aspirate the oral fluids, and to assure that a sterile tip is in place for each patient. You must also clean and maintain the oral evacuator as instructed in the manufacturer's maintenance pamphlet.

Gomco aspirator. The Gomco aspirator is primarily used during periodontic and oral surgical procedures. The small aspirating tips are especially helpful in removing debris, blood, and fluids from tooth sockets during attempts to locate and remove root tips. The suction ability of the Gomco aspirator is better than the saliva ejector but less than that of the oral evacuator. An important part of your role concerning the Gomco aspirator is to assure the sterility of the aspirator handle and the aspirator tip for each patient. When operating this aspirator, keep a close watch on the reservoir bottle to make sure it doesn't overflow. After each use, empty and clean the reservoir bottle, flush the tubing with water, remove and sterilize the aspirator handle and tips, and disinfect the latex tubing. Follow the manufacturer's instruction concerning other maintenance requirements for this piece of equipment.

Exercises (650):

1. What is the purpose of irrigation and aspiration?

2. What type of irrigation media is normally used for restorative procedures?

3. List the irrigation media used for surgical procedures.

Differentiate between the types of irrigation and aspiration equipment by matching the descriptive statement in column B to the equipment in column A.

Column A

___ 4. Gomco aspirator.
___ 5. Saliva ejector.
___ 6. Oral evacuator.
___ 7. Bulb-type or Luer syringe.
___ 8. The unit's water syringe or spray system.

Column B

a. Use for irrigation during surgical procedures.
b. Its low suction power limits its use mostly to removing salivary secretions.
c. Used for irrigation during restorative procedures.
d. Ideal for removing large volumes of solutions from the oral cavity.
e. Primarily used for aspiration during surgical procedures.

651. Define the word "culture" and answer a series of key questions that trace the steps involved with culture preparation.

Preparing Cultures. The task of preparing cultures is important, even though it is not frequently used in all dental specialties. When the word "culture" is used in connection with the work involved in the medical and dental professions, it means the attempt to gather a sample of microorganisms from a patient and to promote growth of those microorganisms. In dentistry, cultures are most frequently associated with endodontics (root canal therapy) and dental surgery (oral surgery and periodontal surgery).

To prepare a culture, there are definite steps to be taken in proper sequence. Basically, these steps involve gathering a sample of microorganisms, placing the sample in or on a suitable culture media, carefully labeling the sample, incubating the sample, and finally evaluating the culture. Some of these steps are performed by the dental officer, some by you, and some by the medical laboratory. Let's further consider these steps one at a time.

Microorganism sample. In the endodontic section, a sample of root canal microorganisms is taken by inserting a sterile paper point into the root canal. The contaminated paper point is placed in a culture medium contained in a test tube, and the tube is then sealed. Microorganism samples from dental surgery sites are usually acquired by swabbing the site with a sterile cotton-tipped applicator. The sample is then placed in a test tube and sealed to prevent further contamination until the sample can be placed on a culture media.

Flame the opening of the test tube upon opening and just before sealing it. To flame the opening of the test tube, tilt it *slightly* and hold it over a lighted Bunsen burner. Flaming destroys microorganisms that may be found near the opening of the tube. This is very important since it helps prevent introducing microorganisms other than those obtained in the sample.

Culture media. Culture media for promoting microorganism growth in endodontic cases are usually in solution form. Two common solutions used are penase ascites and glucose ascites. These solutions appear mostly clear with a slightly yellow tint. The glucose ascites is suitable for rapid growth of many types of microorganisms but is more commonly used with root canal samples that have been treated with camphorated parachlorophenol. In contrast, the penase ascites is specially formulated for use with samples from root canals that have been treated with penicillin. Beef broth gelatin is sometimes used as a culture medium also.

Labeling. Once the sample of microorganisms has been sealed in the test tube, you must complete and attach a label to the tube. There is no one standard label for this purpose. Any label that can be easily attached to the test tube and provide the following information is suitable:

- Patient's name.
- Date and time of sample taken.
- Whether it is the first, second, etc., culture taken.
- Description of sample (root canal, abscess, etc.).
- Type of report desired.

For endodontic purposes, usually a report stating positive or negative is sufficient. For dental surgery reports, however, the dental officer may desire information as to the exact type or types of microorganisms found. When cultures are forwarded to the medical laboratory, they should be accompanied with an SF 557, Miscellaneous Test or Examination, which has been properly filled out.

Incubation. For the microorganisms to grow properly, they must be subjected to culture incubation temperature (37° C. or 98.6° F.). This temperature is attained and maintained in special incubators (small ovens) usually found in Air Force medical laboratories. Usually, a sample of microorganisms introduced to a suitable culture medium will show signs of growth within 48 hours of subjection to the incubation temperature.

Evaluation. Evaluation of cultures is rendered by medical laboratory personnel in nearly all cases. For endodontic purposes, however, the evaluation is not very difficult to make. The only report needed for most endodontic cases is that there is (positive) or is not (negative) visible evidence of microbial growth in/on the culture medium. A cloudy ascites solution is positive, and visible moldlike growth on a gelatin medium is likewise positive.

Exercises (651):

1. Define the word "culture."

2. Describe how the cultures are obtained.

3. What should you do upon opening the test tube just prior to sealing the tube?

4. What type of culture media is commonly used with root canal samples which have been treated with penicillin?

5. What data should be included on the label you attach to the test tube?

6. What type of report is sufficient for endodontic purposes?

7. What incubation temperatures are necessary for cultures to grow properly?

8. How soon should growth be apparent after a culture has been introduced into the incubation media?

9. How does a positive growth structure appear in the gelatin and ascites mediums?

652. Give specific facts about the procedures involved when you are dismissing the patient.

Dismiss the Patient. After a dental operation has been completed, the next procedure is to dismiss the patient. Throughout the dismissal period, be careful to maintain the same cordial, pleasant mannerisms with which you greeted the patient. This kind of personal treatment tends to leave the departing patient with the feeling of having received the finest treatment possible. Careless and rude dismissal of a patient tends to create a negative attitude about the treatment. For this reason and many others, your actions help to create an image of the Air Force dental service.

The first step in the dismissal of a patient is to remove all debris from his face. Better still, hand the patient a hand mirror and a dampened towel and let him clean his face. You may then remove the drape, apron, or protective napkin from the patient. Also, be sure to push the dental operating light and the bracket table to an out-of-the-way position. Further still, you may need to lower the dental chair and move the chair backrest forward, making exiting easier. If the patient brought personal items (such as spectacles) and left them in your care, make it a point to see that he doesn't leave them behind. Should the patient need a further appointment, be sure that he is given one or is given instructions on how to obtain one as applicable. Although the patient treatment is complete, you still have a few more tasks to complete. These include completion of administrative duties and preparation for the next patient.

Complete administrative duties. In most cases you can complete your administrative tasks during breaks in your chairside assisting routine. However, some dental treatment procedures require you to assist at the chairside for the duration of the treatment. In such cases, it is best to complete the dental treatment forms after the patient has been dismissed rather than detain the patient while you write up the forms. Be sure you don't prolong completing these associated administrative tasks, since you may forget some of the specifics involved. Thus, making administrative duties a postoperative function assures timely and accurate entries on treatment forms and records.

Store materials clean and sterilize instruments. All medications and materials used during patient treatment should be put back into proper order. Materials and medications that may be reused should be returned to their proper place in the dental cabinet. The dental instruments laid out for the operation must be scrubbed with soap and water and thoroughly rinsed and dried. The cutting-type instruments should then be sterilized in a dry heat sterilizer. The remaining instruments are usually sterilized in the autoclave. Your role in performing these tasks is critical in preventing possible contamination of the next patient.

Clean and disinfect equipment. Sometimes the cuspidor and dental unit are splattered with debris after patients rinse their mouths. Such debris is sure to be spotted by the next patient if it is not removed. To maintain professional standards, you must not only remove the debris to provide a clean appearance, but you must also disinfect the area with a solution such as isopropyl alcohol. In addition, an alcohol sponge (2- by 2-inch gauze sponge dipped in isopropyl alcohol) should be used to disinfect all other equipment items used or touched during the last treatment session. Items on the dental unit that are frequently used include the air syringe, the water syringe, handpieces, and the dental operating light handle.

Obtain additional needed items. After the patient has been dismissed and the treatment room is restored to its original order, you must obtain any additional equipment or supplies needed for the next operation. For example, your dental officer may be assigned to the restorative dentistry section. Most of the treatment he renders involves placing amalgam and silicate restorations, generally speaking. However, he may decide to construct a gold crown or an inlay for professional reasons. Normally, all the items necessary for a gold crown or inlay appointment are not maintained in each dental treatment room but are in the prosthodontic section. Under these conditions, you would need to obtain the needed items (impression trays, impression materials, etc.) as a preoperative duty.

Exercises (652):

1. Briefly describe the steps involved in preparing the patient to leave the treatment room.

2. When should you complete the necessary administrative tasks?

3. After the patient has departed and the administrative procedures have been completed, what tasks are necessary to restore the treatment room to its original order?

4. What remains to be done after you have restored the treatment room to acceptable order?

653. List the elements involved with dental treatment room supply management, state their importance, and relate your procedural responsibility.

Management of Treatment Room Supply Levels. To fully consider the chairside assistant's role in basic assisting procedures we must give some attention to the supplies used in dental treatment rooms. This requirement includes both patient treatment supplies and the administrative forms needed to record patient treatment. As a general rule, you must inventory, order, turn in, and store dental supplies in the dental treatment room similar to managing supplies in the dental supply section. Naturally, there is a big difference in the volume of supplies handled in the dental treatment room and the dental supply section. Let's consider the elements of inventory, ordering, turning-in, and storing functions one at a time.

Inventory. One of the more important elements in maintaining supply levels in dental treatment rooms is that of conducting thorough and frequent inventories. Inventories are necessary to be sure that you don't run out of supplies during a patient's treatment, and that you don't have an excess of materials on hand. For best results, you should conduct a *daily inventory* of the supply stock in your treatment room. When you have inventory data available, you may compare it with your estimate of the supplies needed to treat the daily schedule of patients and determine the necessary adjustments. To make the adjustments, you may need to turn in or order (requisition) supplies.

Ordering supplies. The exact procedures to follow when ordering supplies within the dental clinic vary from base to base. Some clinics require you to submit a written list of supplies needed each duty day. Other clinics only require you to submit your requirements verbally. You should check with dental supply personnel for the correct ordering procedures to follow. Exercising good supply management is important when ordering supplies. Order a working level of supplies. Do not hoard supplies as this may deprive other personnel of the supplies they need. Hoarding also invites thievery, ties up supply dollars needlessly, and may result in loss due to supply item deterioration. When ordering dental supplies, consider also what types of items are needed. When you submit your order, be sure you have included both the replacement and new items needed for patient treatment. Of course, emergency supply requirements can be filled at any time.

Turning in supplies. As we implied earlier, inventories also determine any supply overages you may have in dental treatment rooms. All overages should be reported to the dental supply personnel or your NCOIC so that further distribution or turn in steps can be taken. As with supply hoarding, failure to turn in overages in dental treatment rooms invites thievery, ties up supply dollars needlessly, and results in dollar loss because of supply item deterioration. Storage of supply items is also important.

Storing supplies. Once you receive dental supplies in the dental treatment room, you have further responsibility to properly store the supplies. Basically, proper storage entails taking the steps necessary to protect the supply items. This means keeping bottles tightly closed, keeping older items in front so that they will be used first, and storing only enough of each supply item to last for a few days. Also remember to keep such items as hydrogen peroxide stored in a cool, dark place; keep certain drugs and precious metals under lock and key; and take any other steps necessary to protect supply items.

Exercises (653):

1. List the elements involved with dental treatment room supply management.

2. Why is it important to inventory supplies?

3. For best results, how often should you inventory your treatment room supplies?

4. Why is it important not to hoard supplies?

5. Why should you turn in supplies that your inventory shows as excess?

380

6. What does the proper storage of supply items basically entail?

3-3. Four-Handed Dentistry

Many studies of dental manpower problems have been conducted over the last 30 years. These studies indicate that the dental profession must increase its productivity to keep up with the dental needs of our growing population. Today's dentists are responsible for treating many more patients than the dentists of the past. In other words, the patient population has been increasing faster than the dentist population. For example, in 1930 there were 58 dentists for every 100,000 people in the United States and in 1965 there were only 45 dentists per 100,000 people. The obvious solution is to produce a greater number of dentists. But this has proven more difficult than it seems. Additional dental schools must be established, existing schools expanded, monies allocated, and more people made interested in a career in dentistry. Another obvious solution is to increase the productivity of the dentists currently in practice. This solution kindled the birth of four-handed dentistry. Four-handed dentistry, as it has been developed, not only increases productivity but reduces stress and fatigue on the operator and his assistant.

654. Identify the guidelines suggested for implementing the four-handed dentistry concept.

Guidelines of Four-Handed Dentistry. Four-handed dentistry, as the name implies, uses the hands of the dentist and the assistant to the maximum extent. Several guidelines are suggested for implementing the four-handed dentistry concept. They are:

- Both the dentist and assistant should operate from a seated position, and the patient should be placed in the supine position.
- Operating equipment should be selected and positioned for the convenience of the dentist and assistant.
- The dentist should keep his hands and eyes in the operating zone.
- All routinely performed operations should be routinized.

Although these guidelines are not rules, they do relate a basic formula for the practice of four-handed dentistry.

Exercises (654):

Identify the guidelines that apply to four-handed dentistry by indicating whether the following statements are true or false, (T or F). If you answer false, state why.

T F 1. The dentist should keep his hands and eyes in the operating zone.

T F 2. The assistant should work from a standing position.

T F 3. The operating equipment should be positioned solely for the convenience of the technician.

T F 4. All routinely performed operation should be routinized.

T F 5. The patient should be placed in the supine position.

655. Given several equipment designs, identify those that are best suited for four-handed dentistry.

Equipment. The selection and positioning of four-handed dentistry equipment is extremely important. Since the operator and assistant are both working from a sitting position, the equipment design must be somewhat different from that for conventional dentistry. Let's look at some of the recommended equipment for four-handed dentistry.

Operating stools. Stools for both the dentist and assistant should be well padded and comfortable. They must be mobile and have a broad base to give them stability. Normally, chairs with at least five casters are preferred. The stools should have a foot-support ring so that the user can keep his feet parallel to the floor, thereby maintaining comfort and posture. Additionally, the stool must have a body support that can be used for either the abdomen or back.

Dental operating chair. This chair should have a thin, narrow back. Chairs with bulky backs make patient positioning difficult and also prevent the dentist and assistant from getting into a comfortable working position. The chair should provide complete body support for the supine patient and have independently powered back and seat controls, which can be conveniently adjusted by either the dentist or the assistant. The chair design

387

should permit rotation for better patient positioning. Additionally, it should have a low base so that the chair can be lowered to within 14 inches of the floor.

Dental unit. Many modern dental units are designed with four-handed dentistry in mind. The unit should be designed so that it is compact and doesn't occupy space needed by the assistant. Hose-attached instruments, such as the handpieces, syringe, and oral evacuator, should be conveniently positioned to both the dentist and the assistant. The most noticeable difference between this unit and the conventional unit is the absence of the cuspidor on the four-handed dentistry unit. The syringe should be the multipurpose type, which supplies air, water, and spray.

Artificial lighting. A ceiling track-mounted light is considered ideal for four-handed dentistry. It should be easily adjusted by either the dentist or the assistant. If a track-mounted ceiling lighting is impractical, chair- or unit-mounted lighting may be used. Ceiling track-mounted lighting is preferred, however, as it is more flexible and does not have mounting attachments that could get in the way of the dentist or his assistant.

Cutting equipment. Ideally, you should have a slow-speed handpiece and two or more high-speed handpieces. Having an adequate number of handpieces eliminates the loss of time previously experienced for changing burs. All handpieces should be controlled by a single, variable-speed foot-control. The foot-control should be the straight line depression type rather than the rotation type. This enables the operator to keep his foot in one position for better control and more comfort.

Cabinets. Avoid overcrowding the treatment room with unneeded cabinets. Normally, a few wall-mounted cabinets are enough to store needed supplies. Two sink-top cabinets should be provided. One is for the dentist to wash his hands, and the other for the assistant to wash his hands and clean instruments. This saves time as neither person has to wait for the other. A specially designed mobile cabinet is also needed. This cabinet should provide easily accessible space for the supplies and equipment needed during the patient's treatment. Additionally, it should provide a working surface over the assistant's lap and be of a height comfortable for the sit-down assistant.

Setup trays. An adequate number of setup trays are needed. As mentioned before, these trays contain prearranged sterilized instruments and materials for specific procedures. Storage space for these trays must also be provided. A good idea is to color code these trays with tape; for example, blue for amalgam, red for silicate, yellow for gold, etc. Instruments may also be coded to identify them as a part of a particular tray setup

Exercises (655):

Of the equipment designs listed below identify the design features best suited for the four-handed dentistry concept by placing a checkmark in the space provided.

1. Operating stool
    ____ a. Equipped with a foot support ring.
    ____ b. Has less than five casters.
    ____ c. Is immovable and has a narrow base.
    ____ d. Has a body support that can be used for either the abdomen or back.
2. Dental operating chair
    ____ a. Has a low base so that it can be lowered to within 18 inches of the floor
    ____ b. Base permits rotation for better patient positioning.
    ____ c. Provides complete body support for supine patients.
    ____ d. Has thick, broad, well-padded backrest.
    ____ e. Has independent positioning controls that can be operated by either the dentist or technician.
3. Dental unit
    ____ a. Has a multipurpose syringe.
    ____ b. Has a compact design.
    ____ c. Has hose-attached instruments conveniently positioned for both the dentist and technician.
    ____ d. Is not equipped with a cuspidor.
4. Artificial lighting
    ____ a. Should be unit mounted.
    ____ b. Should be easily adjusted by either the dentist or technician.
5. Cutting equipment
    ____ a. All handpieces controlled by a single variable-speed foot control.
    ____ b. Has a rotation-type foot control.
    ____ c. Is composed of a slow-speed handpiece and two or more high-speed handpieces.
6. Cabinets
    ____ a. Mounted cabinets should provide sink-top cabinets for both the dentist and the technician.
    ____ b. The mobile cabinet should provide a working service over the assistant's lap.
7. Setup trays
    ____ a. Should never be color coded.
    ____ b. Should contain prearranged, sterilized instruments and materials for specific procedures.

656. State the operating positions that should be employed in the practice of four-handed dentistry.

Operating Positions. Once the patient has been seated, the dentist and his assistant should place themselves in the proper positions for treatment. These positions can be best understood by relating them to a clock (see fig. 3-6). The dentist's stool should be in the 8- to 11-o'clock position, and the assistant's stool should be in the 2- to 5-o'clock position. Instruments and materials are, of course, passed in the transfer zone. The static zone is basically an area of no activity.

The dentist should sit in a position with his back straight and head relatively erect. This helps prevent curvature of the spine. His shoulders should be parallel with the floor and his elbows close to his sides. The patient should be lowered to a position that places the field of operation as close to the dentist's elbow level as possible. The dentist should further position himself so that the patient's mouth is in line with his sagittal body plane. When he is properly positioned, the dentist's eyes should be 14 to 16 inches from the operating site.

As the assistant, you should sit as close as possible to the backrest of the patient's chair with your feet directed toward the head of the chair. This position permits you to reach the field of operation, hose-attached instruments, and the instruments and materials from the mobile cabinet without leaning, twisting, or overextending your arms. You should adjust your stool so that your eye level is 4 to 6 inches above the dentist's eye level. And, like the dentist, you should sit in an erect position. The mobile cabinet should be placed toward the head of the chair and so positioned to allow you easy access to the needed instruments and materials.

Exercises (656):

1. As related to the face of a clock, in what zones should the dentist's and assistant's stools be positioned?

2. In what zone are instruments and materials passed?

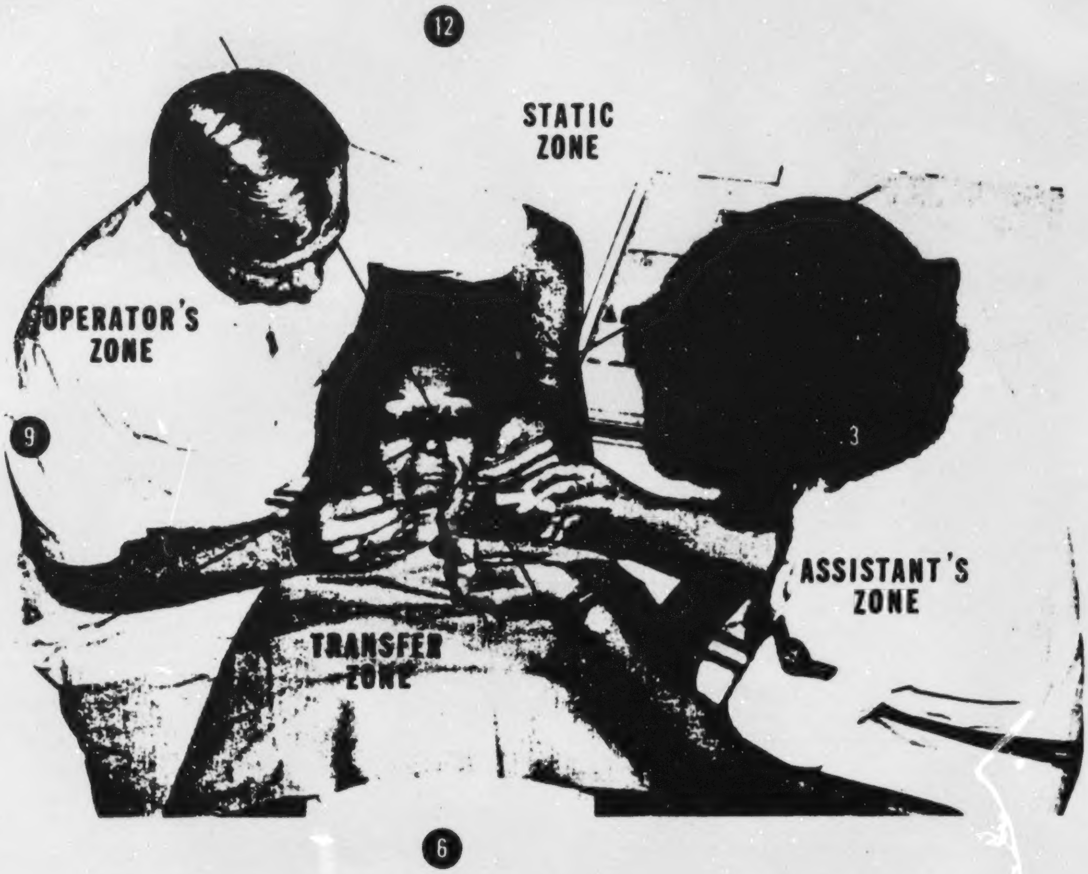


Figure 3-6. Operating zones.

383

3. To what level should the patient be lowered?

4. When he is properly positioned, how far from the operating site should the dentist's eyes be?

5. How should the assistant's eye level be in relation to that of the dentist?

6. Where should you position the mobile cabinet?

657. State the objective of the four-handed dentistry assisting routine and answer a series of key questions that serve to describe the assisting technique employed with the four-handed dentistry concept.

Assisting Duties. As we discuss the assisting duties, keep in mind that the prime objective of four-handed dentistry is to increase production while reducing stress and fatigue to the operator and assistant. This demands that the dentist and his assistant work as a well-knit team. Their two heads and four hands must function together toward a common goal. And, resultingly, you as the assistant are more involved in the patient treatment. One of the guidelines we previously mentioned stated that the dentist's hands and eyes should not leave the working area. This, of course, means that you must fully know the treatment routine and have each instrument and material ready at the proper time. Also, the absence of the cuspidor means that you must aspirate throughout many phases of the procedure. Let's first discuss aspiration.

Aspiration. You might wonder why the cuspidor has been eliminated from the four-handed dentistry unit. Actually the answer is quite simple—it eliminates the time lost when the patient expectorates. This, of course, means that you must aspirate throughout the procedure. You should hold the aspirator tip in a position where it adequately evacuates saliva, debris, and water spray from the handpiece. It must be positioned so that it doesn't interfere with the dentist's line of vision or access to the operating site. Normally, you aspirate with the right hand and transfer instruments with your left hand.

Instrument transfers. Since your right hand is busy aspirating, you must learn to transfer instruments with your left hand. The one-hand instrument pass may sound difficult at first, but it is quite easy to master. Let's assume that the dentist is using instrument "A" and you know that he soon will need instrument "B." You pick up instrument "B" by the end opposite from the working end, and hold it between your thumb and first two fingers. Hold the instrument close to the field of operation and parallel to the instrument being used. The dentist gives you the signal he is ready for instrument "B" by raising instrument "A" from the tooth. Now you take instrument "A" between third and small finger of your left hand, remove it from the dentist's hand and replace it with instrument "B."

Other duties. If your unit is equipped with two high-speed handpieces, you should place the first cutting bur the dentist needs in one handpiece and the second bur he needs in the other. This eliminates time lost from having to change burs. The other assisting duties, such as mixing materials and completing the administrative tasks, remain basically the same. As you get more involved with four-handed dentistry, even more ways of improving your routine become apparent. Keep working on them and improving on them!

Routinizing. To be able to properly anticipate the dentist's needs, you must have a treatment routine. You must know what the dentist is going to do next. To make four-handed dentistry work for you, you must establish a set routine for every operation that can be routinized. Then you must systematically follow that routine. Once you have done this, you and the dentist can accomplish more procedures and be less fatigued at the end of the workday.

Exercises (657):

1. What is the prime objective of the four-handed dentistry concept?

2. Why must you spend more time aspirating during a four-handed dentistry procedure?

390

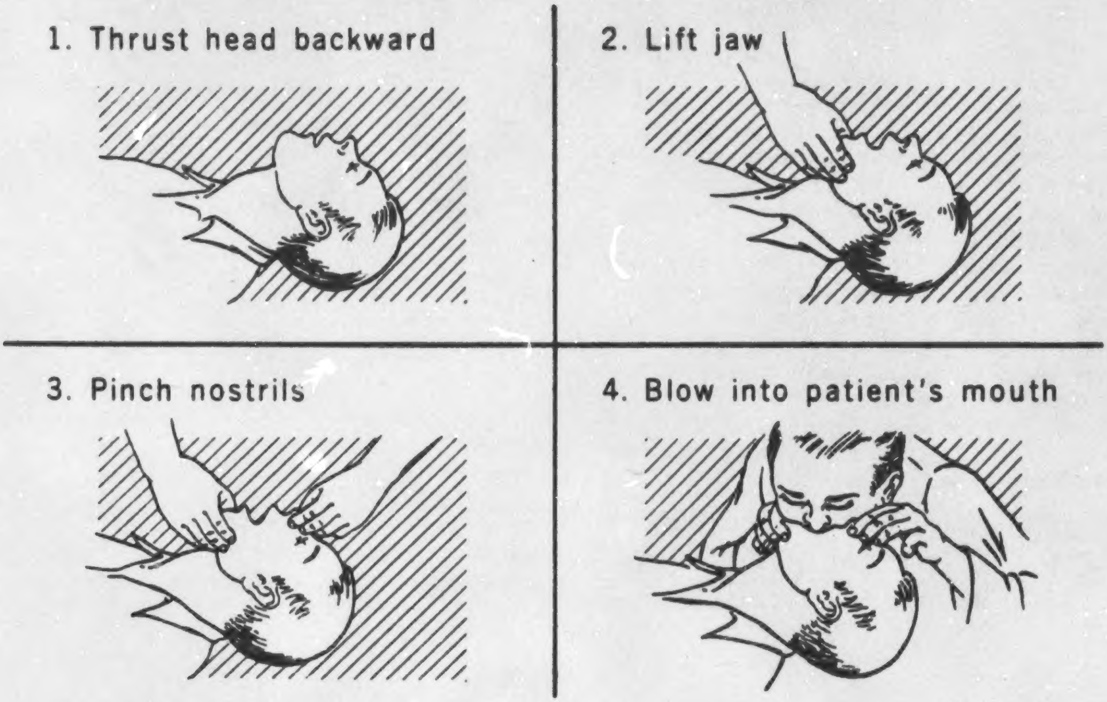


Figure 3-7. Mouth-to-mouth resuscitation.

3. What is gained by the elimination of the cuspidor on the four-handed dentistry unit?

4. How should you position the aspirator tip?

5. How does the four-handed dentistry concept alter your instrument-passing technique?

6. How can you eliminate much of the time lost in changing burs?

7. What must you have knowledge of to properly anticipate the dentist's needs?

3-4. Emergency Procedures

Emergencies (life-death situations) in the dental treatment room are rare. However, when a true emergency arises, all dental personnel should be prepared to deal with it effectively. You, personally, should be ready to administer or assist the dental officer in administering lifesaving steps.

658. State how the steps you may take can help prevent emergency situations from occurring.

Preparation for Emergencies. A recent task survey showed that only a small percentage of the dentistry personnel surveyed had ever used a dental emergency kit. This does not reduce the need for training in this area. Although such events are rare, medical emergencies may be and are encountered in dental practice. Medical emergencies pose a threat to life in the form of severe reactions, complications from drugs and anesthetics, fear, or stress. Since your duties are involved with patient treatment, you must be able to recognize and to administer lifesaving steps if these complications occur. One of your duties is to make sure that proper preparations have been made to cope with emergencies.

Naturally, we desire to prevent emergencies from arising whenever possible. Granting that all preventive attempts will not succeed in every case, prevention should still be our goal. Preventive steps can be taken when dental personnel have knowledge of the patient's medical history (allergies, bleeding tendency, etc.) and when we recognize emergency signs through observing patient actions and responses. For example, a careful check of the dental patient history form(s), AF Form 696, may reveal that the patient is allergic to certain drugs. With this information, the dental officer may use other drugs to treat the patient and, thereby, prevent an emergency. Further, you might observe a patient's response to an injection of lidocaine and detect that he is becoming apprehensive. You may be able to prevent syncope (fainting) in such a situation by allaying the apprehension through casual conversation. Conversation tends to show that you care about the patient and also takes his mind from the present problem. Thus, to be effective in dealing with emergencies, you should be able to recognize them and react rapidly in a favorable manner.

Exercises (658):

1. How can the dental patient history, AF Form 696, help prevent emergency situations?

2. Why should you closely observe the patient's response to an injection of a local anesthetic?

659. Answer a series of key questions that serve to describe the preparations you must make, and the life saving procedures you must know in case emergency situations occur.

Although prevention is our goal, emergency situations do occur. Therefore, you must make sure that oxygen and resuscitation equipment are available, conveniently located, and functioning properly. Check the emergency treatment kit daily to insure that it is supplied with the proper levels of all drugs and equipment, and that these supplies are in good condition and have not passed their expiration date. Have readily available the sources and phone numbers of medical personnel needed for assistance in any emergency arising in the dental clinic. Learn how to administer mouth-to-mouth resuscitation, closed chest cardiac massage, and cricothyroidotomy as part of your preparation for emergencies.

Mouth-to-mouth resuscitation. This is best accomplished by lowering the back of the dental chair so that the patient's head is in a hyperextended position. Grasp the mandible and elevate the chin. In this way, the airway is thrown wide open. Check for and remove any obstructions (vomitus, blood, mucus, cotton rolls, gauze, removable appliances, etc.). Once the airway has been cleared, blow forcefully into the patient's mouth while pinching his nostrils closed. (See fig. 3-7.) A rise in his chest indicates that his lungs are filling with air. Repeat 14 to 18 times per minute for adults and 20 times per minute for children. Use only gentle puffs on children, so as not to rupture their lung sacs.

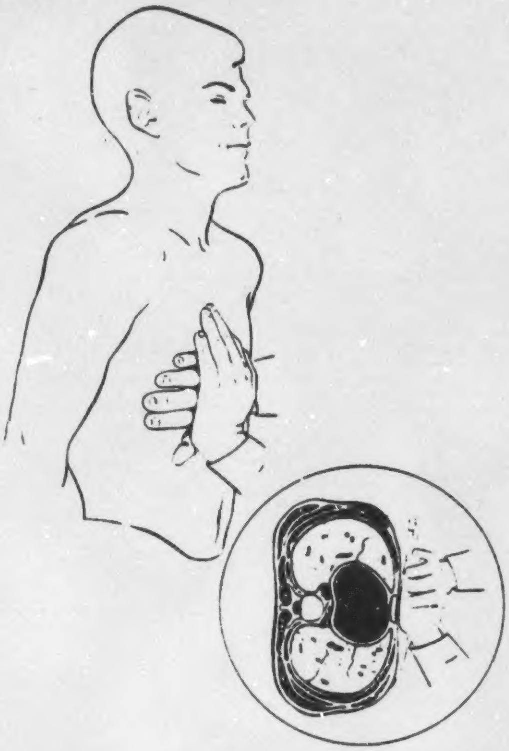


Figure 3-8. Closed-chest cardiac massage.

Closed chest cardiac massage. You can best carry out this massage by placing the heel of one hand on the patient's lower sternum and placing the other hand over the first as shown in figure 3-8. If the patient is a child, one hand is sufficient. Using your body weight, rapidly force the lower sternum downward from 1½ to 2 inches. Hold for one-half second; then rapidly release. Repeat this procedure every second.

When it is necessary to administer both procedures at the same time, it is best for one person to administer mouth-to-mouth resuscitation while another administers closed chest heart massage. The patient must be on a hard surface for cardiac massage to be effective. You may need to remove the patient from the dental chair and place him on the floor.

Emergency airway (cricothyroidotomy). There are two reasons for a patient to stop breathing. One is systemic respiratory arrest, and the other is an obstruction of the air passage. In systemic respiratory arrest, the patient ceases to breathe because of some depression to the nervous system.

The treatment for this is mouth-to-mouth resuscitation as discussed earlier. When the air passage becomes blocked by a foreign substance, attempt to remove the object through the oral cavity. If the blockage cannot be cleared, an emergency airway must be provided below the obstruction. Since rapid treatment and positive results are paramount, the cricothyroidotomy rather than a tracheotomy is preferred. *Only under extreme emergency conditions* where the patient will die without care should you establish an emergency airway. It is not conceivable that you will ever perform this procedure in the dental clinic because there should always be qualified professional personnel available immediately. However, in case such an emergency ever arises, you should know how to perform a cricothyroidotomy.

Position the patient flat on his back, maintaining his neck straight and head hyperextended. This position may be accomplished by using a blanket roll or other object under the patient's shoulders. Use aseptic technique if possible. To locate the cricothyroid space, feel the thyroid cartilage (Adam's apple). Slide your finger just downward to the notch or depression between it and the next ring of cartilage (cricoid cartilage). This almond-shaped depression is the cricothyroid space into which the airway is to be opened (see fig. 3-9).

Make the incision by holding a knife blade between your thumb and forefinger so that no more than one-half inch of the blade protrudes. Insert the blade crosswise into the cricothyroid space. Your fingers will limit the penetration of the blade so that it doesn't reach the esophagus. Widen the incision as required to admit the tube that is to be used as an airway. The blade may be turned up to hold the incision site open for this purpose. Insert the airway into the trachea. If possible, use tubing that cannot collapse. If there is no other material available, a ballpoint pen barrel can be used. Be careful not to lose the material used for an airway into the trachea. Secure the material with tape. Control hemorrhage and keep the airway open. Administer artificial respiration and/or oxygen until the patient is relieved of breathing difficulties. Obtain medical aid as quickly as possible.

Exercises (659):

1. What check should you make of oxygen and resuscitation equipment?

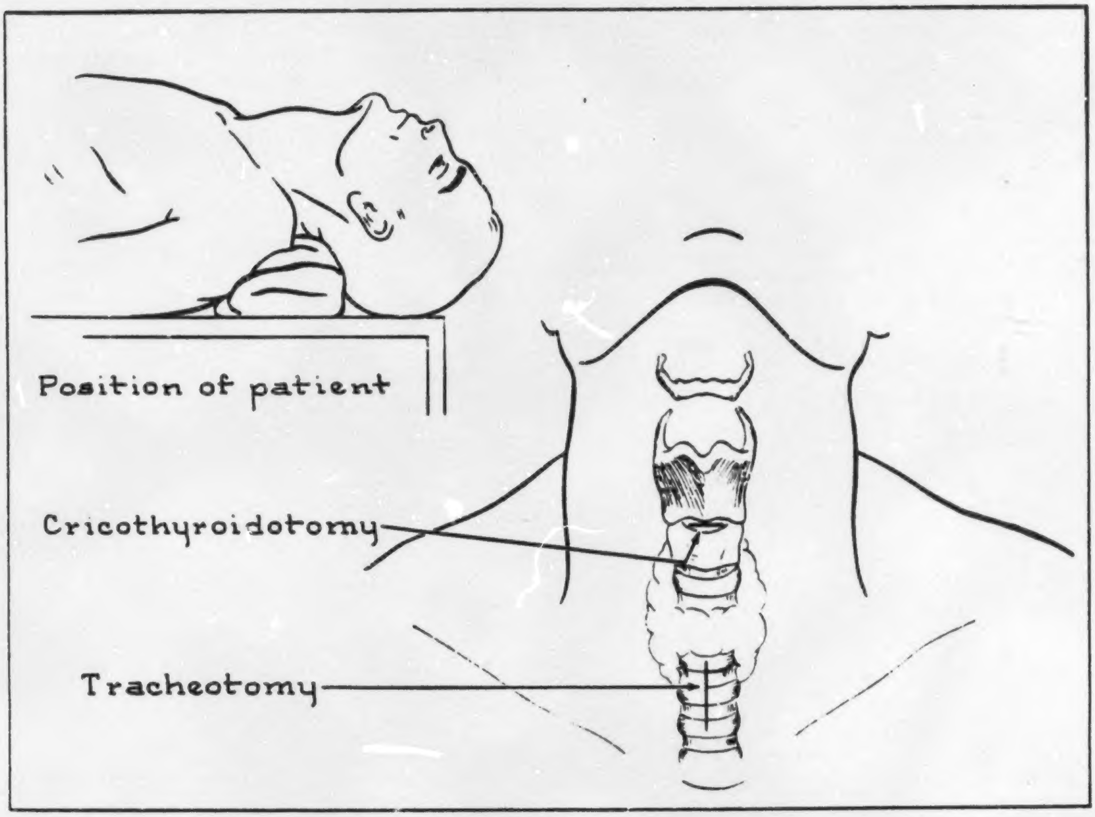


Figure 3-9. Cricothyroidotomy.

2. What should your daily check of the emergency kit include?

3. What phone numbers should you have readily available?

4. How should you position the patient's head for mouth-to-mouth resuscitation?

5. When performing mouth-to-mouth resuscitation, what actions should you take to obtain an open airway?

6. When giving mouth-to-mouth resuscitation, what should you do to the patient's nose?

7. How often should you inflate the lungs when giving mouth-to-mouth resuscitation?

8. Briefly describe how to perform closed chest cardiac massage to an adult.

9. What type of surface must the patient be placed on for cardiac massage to be effective?

10. When would a cricothyroidotomy be performed?

11. How should the patient's head be positioned for a cricothyroidotomy?

12. Where is the cricothyroid space located?

13. When performing a cricothyroidotomy, why should you hold the blade between your thumb and forefinger so that no more than one-half of the blade protrudes?

14. When possible, what type of tube should be used when performing a cricothyroidotomy?

660. Explain why safety precautions are necessary when dealing with oxygen; and given a series of true and false statements, indicate the proper method of maintaining and administering oxygen.

Emergency Equipment and Supplies. Normally, the equipment and supplies needed to handle dental emergencies include oxygen, oxygen equipment, and an emergency kit. The exact makes and models of the equipment vary from base to base as do the items that make up dental emergency kits. You must know the exact location of the equipment, be able to use and maintain the equipment, know the contents of the dental emergency kit, maintain the emergency kit, and be able to assist the dental officer in using the emergency kit.

Oxygen equipment. Oxygen and oxygen equipment should be available in each dental treatment room. The equipment includes oxygen cylinders, a regulator to control the flow of oxygen, a mask, a rebreathing bag (not always included), and connecting items. There are some precautions you should strictly adhere to when using oxygen.

Remember that oxygen supports combustion and that an oxygen tank contains stored energy under pressure. Even a small spark will glow much brighter in the presence of oxygen and could be enough to trigger an explosion. For this reason, you should observe the following precautions when handling oxygen cylinders and regulators:

a. Post "No Smoking" signs where oxygen cylinders are stored or in use.

b. Store full and empty oxygen cylinders in separate, designated areas.

c. Keep all volatile materials, such as oil, grease, and alcohol, away from oxygen cylinders. Also keep cylinders away from heaters, boilers, radiators, sterilizers, and all electrical equipment.

d. Never use oil or grease to aid in connecting regulators to the cylinders.

e. Label all regulators with a tag which reads "Do Not Oil or Grease."

f. Test regulators daily for correct operation.

g. Do not attempt to repair regulators. Turn in defective regulators to supply and obtain a serviceable regulator in return.

In addition to the above-listed precautions, you may find the following suggestions useful:

a. Always maintain an extra, full oxygen cylinder on hand in case it is needed. Extra cylinders can be obtained from medical supply.

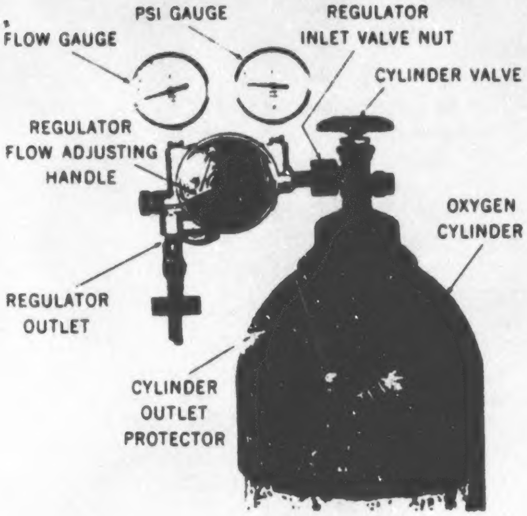

PSI GAUGE
REGULATOR INLET VALVE NUT
FLOW GAUGE
CYLINDER VALVE
REGULATOR FLOW ADJUSTING HANDLE
OXYGEN CYLINDER
REGULATOR OUTLET
CYLINDER OUTLET PROTECTOR

Figure 3-10. Oxygen cylinder.

b. Remember to keep a close watch on the regulator gauges to determine when you need to exchange cylinders.

c. Before connecting the regulator to a new oxygen cylinder, always "crack" the cylinder valve first. By "crack" we mean to open and close the cylinder valve rapidly. This "cracking" removes any dust or debris that may have collected in the cylinder outlet. Always do the "cracking" in a safe place and point the cylinder outlet away from you.

After a regulator has been connected to the oxygen cylinder, a face mask must then be connected to the regulator before oxygen can be administered to a patient. Figure 3-10 shows a cylinder with a regulator in place.

There are two types of face masks commonly used—the nasal and the oronasal. The nasal mask covers only the nose. It cannot be used on unconscious patients. The oronasal mask covers both the nose and the mouth and is the most commonly used of the two types. Figure 3-11 shows the oronasal mask with the rebreathing bag and connector tubing. Once the oxygen cylinder has been cracked, the regulator is in place, and the facial mask has been connected to the regulator, the equipment assembling is complete.

The procedure for administering oxygen is fairly simple. Once the dental officer indicates he desires to administer oxygen, tell the patient. Then make sure that the regulator valve is open and open the cylinder valve. Next, adjust the regulator to release from 6 to 10 liters of oxygen per minute. As you apply the mask to the patient's face, ask him to exhale. You may then adjust the mask-retaining straps and further adjust the oxygen flow. Normally, the dental officer will indicate how many liters of oxygen to administer per minute. If he does not do so, or should you happen to be giving the oxygen alone, adjust the flow between 4 and 8 liters per minute. Oxygen flow between 6 and 8 liters per minute is pure oxygen. Many dental officers desire the oxygen regulator be set at 5 for most oxygen therapy. Keep a careful watch on the rebreathing bag. The bag should expand when the patient exhales and deflate when the patient inhales. If the oxygen equipment you are using does not have a rebreathing bag, you may observe the patient's breathing effort by watching his chest. In either case, if the rebreathing bag does not expand and deflate properly, or if the patient appears to be laboring excessively to get enough air, quickly check the equipment for possible malfunctions and make corrections and adjustments as required. Call for help if needed.

After the mask has been used on a patient, disconnect it and remove the sponge rubber disks. You may then scrub the mask with soap and water and rinse it thoroughly. Then soak the mask in zephiran chloride 1:1,000 for 20 minutes. Finally, rinse the mask and the rubber foam disks under running water and allow them to air dry before they are reused. As you may have already concluded, you should always have more than one mask available for use.

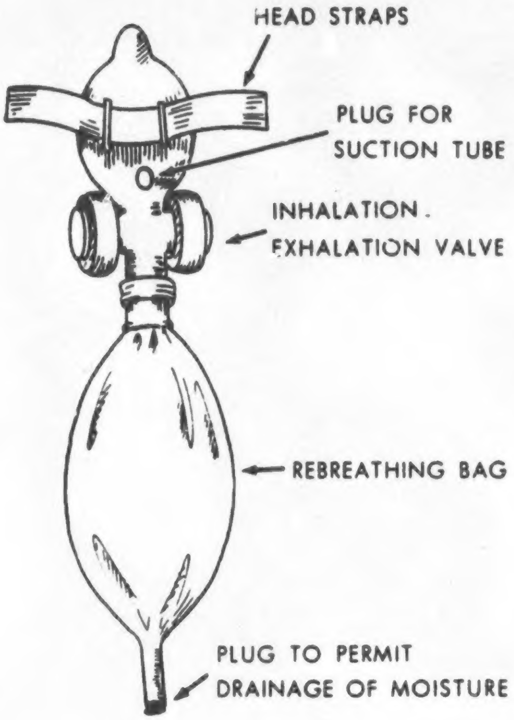

HEAD STRAPS
PLUG FOR SUCTION TUBE
INHALATION - EXHALATION VALVE
REBREATHING BAG
PLUG TO PERMIT DRAINAGE OF MOISTURE

Figure 3-11. Oronasal mask.

Excercises (660):

1. Why is it necessary to follow certain safety precautions when dealing with oxygen?

Identify the procedures that should be taken when maintaining oxygen by indicating whether the oxygen maintenance procedures described in items 2 through 8 are true or false.

T F 2. Post "No Smoking" signs where oxygen cylinders are stored or in use.

T F 3. Keep cylinders away from heaters, boilers, radiators, sterilizers, and electrical equipment.

T F 4. Make sure that all regulators that connect to the cylinder are well oiled.

T F 5. Test regulators monthly for correct operation.

T F 6. Store empty and full oxygen cylinders in separate designated areas.

T F 7. Personally perform the necessary repair procedures on the regulators.

T F 8. Before connecting the regulator to a new oxygen cylinder, you should always "crack" the cylinder first.

Identify the proper procedures to be used when administering oxygen by indicating whether the procedures listed in items 9 through 13 are correct or not. Identify the proper procedures by circling T for true, and the improper procedures by circling F for false.

T F 9. If you wish to administer oxygen through the nose only, you should select an oronasal mask.

T F 10. When administering oxygen, you normally set the regulator to release from 18 to 20 liters per minute.

T F 11. If you wish a flow of pure oxygen, you should set the regulator to release from 6 to 8 liters per minute.

T F 12. When the patient inhales, the rebreathing bag should inflate.

T F 13. After the mask has been used, you should remove the sponge rubber disk, then scrub the mask with soap and water, rinse, and soak the mask in zephiran chloride 1:1,000 for 20 minutes.

661. Given a series of statements that relate the purpose of emergency kit items, match them to the specific item, and describe your role in maintaining and using the kit.

Emergency treatment kit. All dental clinics should set up an emergency treatment kit, tray, or drawer convenient to all locations where patients are being treated. If you use a cabinet drawer, use the same drawer in all dental cabinets to avoid confusion. You should be completely familiar with all drugs and equipment in this drawer so that you can properly assist in any emergency and can maintain the equipment and supply levels. The following is a list of drugs and materials which should be included in the dental emergency kit:

a. Airway—for mouth-to-mouth resuscitation.

b. Ammonia carpules—a mild stimulant for syncope.

c. Epinephrine 1:1,000—antiallergic drugs.

d. Diphendydramine (benadryl)—antiallergic drugs.

e. Pentobarbital or sodium secobarbital—sedative and anticonvulsive.

f. Amyl nitrite pearls and nitroglycerin tablets—coronary dilators for angina pectoris.

g. Ephedrine sulfate, injectable—vasopressor.

h. Solu-Cortef—severe shock and acute reactions to drugs.

i. Materials for administration of these drugs should include syringes, hypodermic needles, sterile isotonic saline, and a tourniquet.

Your role in using an emergency kit is supportive in nature. Mainly, you are to maintain the emergency kit and to assist the dentist as he uses the kit. In either case, you should apply yourself as if human life is directly dependent upon you.

Proper maintenance of an emergency kit is a daily affair. That is, you should inspect the kit daily to determine its adequacy and then correct any deficiencies noted. Inspections have revealed that kits sometimes contain drugs with expired potency dates and that previously used drugs aren't always replaced. Be sure to keep your kit(s) ready for use.

Your proper assistance in the use of emergency kits increases the dentist's total treatment capability. In other words, the semiprofessional tasks that you complete free the dentist to concentrate more upon the immediate professional requirements. Normally, these semiprofessional tasks include placing needles or syringes, loading syringes with proper drugs, and applying tourniquets for intravenous injections. In conclusion, the use of dental emergency kits is intended to be a dentist-assistant team effort.

Exercises (661):

In exercises 1 through 8 identify the purpose of the items kept in the emergency kit by matching the purpose listed in column B to the item listed in column A.

	Column A	*Column B*
____	1. Ephedrine sulfate.	a. A mild stimulant for syncope.
____	2. Solu-Cortef.	

	Column A	*Column B*
____	3. Pentobarbital.	b. An antiallergic drug.
____	4. Syringes, needles, and tourniquet.	c. For the administration of drugs.
____	5. Benadryl.	d. For mouth-to-mouth resuscitation.
____	6. Ammonia carpules.	e. A coronary dilator for angina pectoris.
____	7. Airway.	f. To act as a vasopressor.
____	8. Nitroglycerin tablets.	g. A sedative and anticonvulsive.
		h. For severe shock and acute reactions to drugs.

9. Describe your role in maintaining and using the emergency kit.

662. Given a verbal description of an emergency situation identify the emergency and the action that should be taken.

Recognition and Correction of Emergencies. If emergencies occur, you must be able to recognize them and assist in their correction. The following brief descriptions provide only word pictures of emergency procedures. There should be regular training sessions in your clinic to make sure that all personnel are qualified to administer appropriate lifesaving measures.

Psychogenic reactions. A psychogenic reaction is an alarm mechanism, characterized by sudden dilation of peripheral blood vessels resulting in loss of blood to the brain. The causes are usually mental, triggered by fear. The signs and symptoms are dizziness, nausea, cold perspiration, blood-pressure drop, dilation of the pupils, loss of consciousness, and occasionally brief convulsion.

The treatment is to place the patient in a supine position with his feet higher than his head. Break an ammonia carpule and have the patient sniff it. Place a cold towel on his forehead and let it drape over the temples. Loosen his collar button, tie, and belt. Keep the patient's mouth cleared. Have oxygen handy and administer it if necessary. Recovery is usually rapid.

Toxic reactions. A toxic reaction is usually the result of an overdose (or excessive amount) of a drug. The toxic reaction takes place only when there is sufficient concentration of the drug in the blood stream to affect respiration or circulation adversely. These reactions are caused by administering too much of the drug or administering it too fast. The dentist should diagnose and treat toxic reactions. The emergency treatment is to place the patient in the Trendelenburg position (on his back on a plane inclined approximately 45° with legs and feet hanging over the end of the chair) and administer oxygen.

Anesthetic allergy reactions. There are three types of reaction to local anesthetics: allergic reaction, toxic reaction, and hypersensitivity:

a. Allergic reaction. The most common allergic reaction to local anesthetics appears as a rash, swelling, or redness. The rash can appear on other parts of the body, such as the arms. The swelling and redness are usually around the area of injection. These reactions usually occur soon after the injection; however, swelling may occur at the injection site 12 to 24 hours later. The anaphylactic (allergic) shock is the least common of the reactions from a local anesthetic. This reaction is characterized by a sudden circulatory and respiratory collapse. The blood pressure drops and respiration is impaired. The dentist usually treats this type of reaction with a subcutaneous injection of 1:1,000 epinephrine. Administer oxygen under pressure or by mouth-to-mouth resuscitation. An antihistamine drug may also be given. These reactions should be treated by the dental officer. In mild cases, oral antihistamines may be given. In the more severe cases, injections of epinephrine or antihistamine may be given.

b. Toxic reaction. Toxic reactions are the result of an overdose of local anesthetic. This type of reaction was discussed earlier. In dentistry, the toxic reaction to a local anesthetic is usually the result of injecting the solution directly into a blood vessel.

c. Hypersensitivity. Some patients have a hypersensitivity to local anesthetics. These patients develop all of the symptoms of a toxic reaction even though only a minimal amount of the drug is given. The diagnoses and treatments are the same as for toxic reactions as discussed earlier.

Penicillin allergy reactions. There are two types of reaction to penicillin. The first type is the immediate or anaphylactic type, which occurs within minutes to several hours after administration. The delayed or serum sickness type of reaction occurs several days to 2 weeks after administration. This type is characterized by urticaria, angioneurotic edema, fever, pain in the joints, and swelling.

Penicillin should not be given in the dental clinic. The dentist should prescribe oral penicillin if conditions permit. If this is not possible, shots should be given in the hospital shot room.

Angioneurotic edema. This is a form of giant urticaria (hives) characterized by localized painless swelling of subcutaneous tissue in various parts of the body. It may also appear in the mouth. The reaction is an allergic response to food, drugs, infections, or emotional stress. This reaction is common in patients with a history of allergy. It is also caused by trauma. It must be treated by the doctor. He treats it with an antihistamine drug, such as benadryl.

Insulin shock. Insulin shock is caused when the concentration of glucose in the blood drops below the normal limit. The signs and symptoms are profuse sweating, nervousness, headache, dizziness, mental confusion, transient unconsciousness, convulsions, and coma. Insulin shock may be confused with psychogenic reactions. The early symptoms are not always present, and the attack may begin abruptly. Obtaining a good medical history is important. The administration of sugar constitutes the treatment for insulin shock. Have the patient swallow 1 or 2 teaspoons of sugar and give him a small glass of orange juice if possible.

Epileptic seizure. An epileptic seizure is defined as an intermittent disorder of the nervous system believed to be caused by a sudden, excessive discharge of cerebral neurons. The result is an almost instantaneous disturbance of sensation, loss of consciousness, convulsive movements, or some combination of these. The cause of epilepsy is either a hereditary factor or pathologic changes in the brain from such disorders as encephalitis, meningitis, tumor, hemorrhage, or trauma. The signs and symptoms are warning aura (a subjective sensation to lights) and crying, unconsciousness, convulsions, and coma.

The treatment for epileptic seizure is to give oxygen, place a firm pad between the patient's teeth, prevent injury, and loosen his clothing. Dilantin is the drug of choice, and it should be on hand when you are treating patients with a history of epilepsy.

Cerebral-vascular accident. A rupture, thrombosis, or embolism occurring in a cerebral vessel constitutes the primary, sudden emergency that may be seen in the dental office. The symptoms vary with the area of the brain affected. The patient may have sharp pains, drowsiness, bleeding from the ear, or a numb feeling in any area of the body. There is little treatment that you can give these patients. Keep the patient calm, administer oxygen, call a physician, and alert the hospital emergency section.

Cardiovascular emergency. Angina pectoris is caused by diminished blood supply to the cardiac muscle. The patient has severe pain in the chest. The pain may radiate to the left arm and neck. The blood pressure rises. His pulse remains strong. The treatment is to place a nitroglycerin tablet under his tongue, and administer oxygen.

An acute myocardial infarction lasts longer than angina. The patient has severe pain in his chest radiating down his left arm. The treatment is to keep the patient calm, call a physician, and alert the hospital.

A patient with cardiac arrest loses consciousness. There is no pulse rate, and respiration stops. When this happens, the ultimate emergency is present. Action without panic may save the patient's life. Oxygen must be delivered to the lungs with pressure equipment or by mouth-to-mouth resuscitation. Closed chest cardiac massage must be started in conjunction with the oxygen delivery. Have someone call a physician and alert the emergency room.

Exercises (662):

Column A below lists some emergency situations that could occur in the dental clinic. Column B lists actions that should be taken in the event of a specific emergency. Immediately following columns A and B are descriptions of the patient's condition. Next to each emergency description a space is provided for you to identify the emergency situation and to show what action should be taken. Identify the situation with a choice from column A and the action with a choice from column B.

Column A (Situation)

a. Insulin shock.
b. Cardiac arrest.
c. Anaphylactic shock.
d. Cerebral-vascular accident.
e. Epileptic seizure.
f. Angina pectoris.
g. Psychogenic reaction.

Column B (Action)

a. Inject 1:1,000 epinephrine subcutaneously and administer oxygen.
b. Place a nitroglycerin tablet under the patient's tongue and administer oxygen.
c. Start closed chest cardiac massage in conjunction with oxygen delivery. Have someone call a physician and alert the emergency room.
d. Place patient in the supine position and loosen his clothing, have him sniff an ammonia carpule, and place a cold towel on his forehead. Stand by with oxygen.
e. Place a pad between the patient's teeth. Loosen his clothing and administer dilantin.
f. Keep the patient calm, administer oxygen, call a physician, and alert the hospital emergency section.
g. Have the patient swallow 1 or 2 teaspoons of sugar, and give him orange juice if possible.

Description

Almost instantaneous disturbance of sensation, loss of consciousness, convulsive movements, or a combination of the above. Unconsciousness is often preceded by a subjective sensation to lights and crying.

___ 1. Situation.
___ 2. Action.

Usually triggered from fear. The signs and symptoms may include dizziness, nausea, cold perspiration, blood pressure drop, pupil dilation, loss of consciousness and occasionally brief convulsions.

___ 3. Situation.
___ 4. Action.

Sudden respiratory and circulatory collapse immediately following the injection of a local anesthetic.

___ 5. Situation.
___ 6. Action.

Profuse sweating, nervousness, headache, dizziness, mental confusion, transient unconsciousness, convulsions, and coma.

___ 7. Situation.
___ 8. Action.

Strong pulse, a rise in blood pressure, severe chest pain that radiates to the left arm and neck.

___ 9. Situation.
___ 10. Action.

Sharp pains, drowsiness, bleeding from the ear, and a numb feeling in any part of the body.

___ 11. Situation.
___ 12. Action.

The patient has lost consciousness, has no pulse rate, and respiration has stopped.

___ 13. Situation.
___ 14. Action.

CHAPTER 4

The Specialty Sections

A TYPICAL Air Force dental clinic contains several specialty sections. Each of these sections is manned and equipped to provide a special kind of dental treatment. To illustrate, let's compare a dental clinic to a modern department store. Unlike past "general merchandise stores," where one could obtain all needed articles from one small room or building, the modern department store contains several specialty departments or sections. If one desires a shovel today, he must go to the hardware department; if he desires shoes, he must go to the footwear department; if vitamins, to the drug department, just to mention a few items. Similarly, in Air Force dental clinics, examinations are performed in the examination and treatment planning section, and teeth are extracted in the oral surgery section. You may be assigned to assist in any one or all of the specialty sections during your Air Force career.

To be an effective dental assistant, you must know what procedures are accomplished in each of the specialty sections, and you also must be able to perform the proper assisting techniques. Although the basic assisting procedures have been discussed in Chapter 3, the various specialty sections have some additional requirements. This chapter discusses the individual specialty sections and your role in these sections.

4-1. Examination Section

Dental examinations constitute one of the basic professional services provided by the Air Force dental service. The time, skill, and effort required to accomplish and record dental examinations are as important as those for any other dental procedures.

663. State the functions of the examination and treatment planning section and answer key questions which serve to describe the assisting procedures required in this section.

Examination Section Procedures. There are several different functions or procedures accomplished in the examination section. These functions include:

- Scheduled annual examination of military members.
- Examination of sick call patients and the routing of such patients for immediate treatment when necessary.
- Treatment planning for members eligible for care.
- Special examinations in support of the medical mission.

Annual Examination. Probably the most frequent purpose for administering a dental examination is to meet the annual examination requirement. To facilitate the accomplishment of these annual examinations, consolidated base personnel offices furnish the dental service and organizational units with machine rosters. These rosters are made up according to organization and birth month. Each unit coordinates the scheduling of the dental examinations with the dental service and sends an annotated notification card to the unit members to advise them when to report for the examination. The records of persons who have transferred should be removed from the file and disposed of according to appropriate directives.

Dental sick call. Another important function of the examination section is the examination and routing of sick call patients. The purpose of the sick call examinations is to diagnose the patient's dental problem and to route him to the appropriate treatment section. Many of the patients reporting to dental sick call have a painful dental condition that demands immediate treatment, while others have developed a condition that is not painful but that should be treated in the near future. For example, a painful acute periapical abscess requires immediate attention. The patient with this condition is seen by the examination section radiographs are ordered and read, the condition is diagnosed, and the patient is referred to either the oral surgery or endodontic section for the appropriate immediate treatment. Some sick call patients do not, however, require immediate attention. For example, if the patient has lost a restoration and is not in any pain, the examination section simply diagnoses the condition and has the patient scheduled for an appointment with the restorative dentistry section.

Treatment planning. A treatment plan is developed to provide a systematic approach to clinical dental care. The first step in developing a treatment plan is to record the findings of a thorough examination, including the condition of the oral and adjacent tissues, diagnostic measures, and consultations required. The treatment plan may also include the following: emergency treatment; treatment to prevent early development of emergency conditions; initiation of treatment of periodontal and other soft tissue disease; individual instructions and motivation in toothbrushing, diet, eating habits, and other self-care measures; a thorough prophylaxis, with consideration given to the use of a prophylaxis paste containing stannous fluoride or a topical application of stannous fluoride solution; correction of gross discrepancies of occlusion; exodontia and other necessary oral surgery; restoration of carious tooth structure; and preparation of the mouth to receive prosthetic appliances.

Special examinations. Dental examinations in conjunction with medical physical examinations may be requested for a number of purposes. These include, but are not limited to, examinations required for enlistment, commissioning, remote or isolated duty, flying training, enrollment in the Air Force Academy, and assignment as a food handler. Normally the type of dental examination required is indicated on the patient's physical examination form. If it is not indicated, you should find out the purpose of the examination and refer to the foldout located in the back of AFM 162-1, *Administration of USAF Dental Activities.* This foldout tells you the type of examination required, the forms involved, the dental standards the patient must meet, and any other special requirements.

Examination Assisting Duties. The majority of your tasks performed in the examination and treatment planning section involve the completion of forms. For this reason, you must have thorough knowledge of the types of examinations, charting symbols, diagnostic nomenclature, authorized abbreviations, and dental classifications. You must also perform the basic assisting procedures, such as receiving and seating the patient, selecting and arranging instruments and medications, and coordinating patient needs with other sections.

It is especially important that you maintain the proper attitude and guard against improper personal actions while you assist in the examination and treatment planning action. Naturally, such behavior is desirable in all dental clinic sections, as was mentioned before. However, your behavior is very critical in the examination and treatment planning section because this is where a patient is first exposed to the professional treatment area of the dental clinic. The old adage "The first impression is a lasting impression" is the point in question here. By being cheerful, courteous, prompt, and thorough, you help create the desirable first image of the dental service on your base. Exercise extreme care to see that a patient is not overlooked when his needs are to be coordinated with other sections. Deliberate followups can help eliminate such problems. Another specialty in the Air Force dental clinic is the restorative section.

Exercises (663):

1. State the functions of the examination section.

2. What is probably the most frequent purpose of administering a dental examination?

3. What is accomplished during sick call examinations?

4. What is the purpose of treatment planning?

5. To what publication should you refer if you are trying to determine the type of dental examination required by an applicant for flying training?

6. What do the majority of your tasks in the examination and treatment planning section involve?

7. Why is your behavior in the examination and treatment planning section extremely critical?

4-2. Restorative Section

Since the heaviest workload in any dental clinic is restorative dentistry, most dental specialists are assigned as restorative assistants. Restorative dentistry (operative) includes the treatment and restoration of carious teeth with metallic and nonmetallic restorative materials. These materials are usually amalgam, silicate, resins, and gold. If the dental assistant is well trained and works closely with the dental officer, the patient may receive more treatment in a shorter length of time. Let's first discuss restorative procedures, followed by restorative assisting duties.

664. State the function of the restorative section and answer key questions that serve to describe the assisting procedures required in this section.

Restorative Procedures. The restorative dentistry section strives to restore decayed or fractured teeth to their original functional ability and esthetic quality of healthy dentition. In general, restorative procedures include the following:

- Determining the procedure(s) to be accomplished.
- Administering anesthesia.
- Preparing the cavity or cavities to be filled.
- Placing filling material(s) into prepared cavities.
- Carving and finishing restorations.
- Smoothing and polishing restorations.

All of the above procedures are the primary responsibility of the dental officer. Your role in restorative dentistry is to help the dental officer complete each step.

Restorative Assisting Duties. After you have seated the patient, don't forget to maintain light conversation until the dental officer arrives. You should also check the name, rank, and serial number on the treatment record with the patient. Sometimes patients have identical names and rank, so all that identifies them to the treatment records are their serial numbers. After identifying the record with the patient, place it where it will be convenient to the doctor. The radiographs and the treatment records should be out for viewing by the doctor when he arrives. This arrangement reduces errors and saves time. The patient should now be comfortable in a preoperative position.

When the doctor arrives, wash your hands and dry them in full view of the patient. The patient is then further impressed with the idea of cleanliness and sterility. Then remove the instruments for the examination or operation from the cabinets and lay them out in the arrangement and location from which they are used. It is best to set out only the instruments that are going to be used on each phase of the procedure. This reduces a cluttering effect of instruments and patient apprehension. If the saliva ejector is to be used, attach a sterile tip to the dental unit after the patient has been seated. This assures the patient of the cleanliness of the saliva ejector apparatus. Do not hang the instruments over the edge of the bracket table since they are easily dropped from this position. Turn on the operating light and adjust it to the operating field as the dental officer approaches the patient.

After the dental officer has determined which tooth or teeth to restore, the next step is to administer the anesthesia. Perform your share of these duties out of the patient's view. When the dental officer is ready to proceed with the injection, pass the gauze sponge to wipe the injection site. Receive the sponge and pass the cotton-tipped applicator. While the dental officer is administering the topical anesthetic, loosen the protective cover from the needle. Hold the syringe by the barrel so that the handle may be passed to the dentist. Receive the cotton applicator and pass the syringe. As the dentist receives the syringe, remove the protective cover from the needle. After the injection has been completed, replace the protective covering on the needle in case a second injection is needed.

After the preliminary preparations, the actual treatment begins. If you are well prepared, the operation should proceed smoothly without delay, and the patient will be more at ease and confident. Watch closely during the operation and be prepared to hand the instruments and medicines to the doctor as they are needed. Immediately remove those instruments that are no longer required. Maintain a clear field of vision for the dentist by retracting the cheeks or tongue and irrigating and aspirating as required.

Mix and pass restorative materials by following the procedures we mentioned earlier—namely, exercising care to mix at the right time and following the manufacturer's instructions. Once the restorative materials have been placed in the cavity, the dental officer then begins the carving and finishing of the restoration. He does not normally require assistance at this time. You may then make good use of this "free" time by completing the forms and records that reflect the treatment the patient has received.

Once the operation has been completed, you are expected to begin your postoperative duties. If future appointments are needed, be sure that the patient knows the procedure to follow to obtain one. Dismiss the patient in the same cordial, pleasant manner that you greeted him, and you can be sure he will leave with a feeling that he has received high-quality treatment provided by the dental service. You may then remove all instruments laid out for the operation. These instruments must be washed and then sterilized regardless of whether or not they were used. Return the medications, materials, and equipment to their proper places and prepare the chair and cabinet for the next patient.

Exercises (664):

1. What is the function of the restorative dentistry section?

2. What should you do after you have seated the patient and are waiting for the dental officer to arrive?

3. What procedures should you perform between the time that the dental officer enters the treatment room and the time that treatment begins?

4. Why should you replace the protective covering on the anesthetic needle after the injection has been completed?

5. How do you maintain a clear field of vision for the dentist during the restorative procedure?

6. When is normally a good time to complete the forms and records that reflect the treatment the patient has received?

7. When you are performing your postoperative cleanup, what should you do with instruments that were laid out for the procedure but were not used?

4-3. Oral Surgery Section

Oral surgery is a speciality of dentistry dealing with the surgical treatment or correction of diseases, defects, or injuries of the oral cavity, teeth, and adjacent tissues. In this section on oral surgery, you learn what procedures are commonly accomplished and also how you are expected to perform.

665. Given descriptions of the various procedures performed in the oral surgery section, match each description to the appropriate procedure.

Oral Surgery Procedures. To start our discussion of the oral surgery section, let's look at some of the common oral surgery procedures:

a. Extractions. The removal of erupted, diseased, or malposed deciduous and permanent teeth.

b. Retained root removals. The removal of retained roots that may be buried in the bone and not visible in the oral cavity. Retained root tips may be present due to fractured teeth, advanced decay, or an incomplete postsurgical procedure. They are usually detected on radiographs.

c. Surgical removals. The removal of impacted embedded, or partially erupted teeth involving tissue incision, excision, or bone removal. Removal of unerupted third molars is the most commonly performed surgical removal.

d. Alveolectomies. The removal of the alveolar bone. It is usually performed in conjunction with a surgical removal or multiple extraction (1) to eliminate sharp bone edges that could cause discomfort to the patient and (2) to provide suitably contoured bone structure for denture fabrication and insertion. At times, however, this may be an independent procedure to prepare past extraction sites for dentures.

e. Cystectomies. The removal of cysts and periapical granulomas.

f. Tori removals. The removal of abnormal, bony growths, which are often found on the lingual surface of the body of the mandible or the center of the hard palate. Usually tori removals are done to permit fabrication and insertion of dentures.

g. Frenotomies. The surgical removal of that tissue which restricts movement of the tongue (lingual frenum) or lips (labial frenum). The excision of the lingual frenum is done to help correct tongue tie. The labial frenum may be done to enable better lip movement and to help prevent large diastemas (spaces) between erupting central incisors.

h. Biopsy. The removal of a piece of tissue from a living subject for diagnostic and microscopic examination.

i. Foreign body removals. The removal of any foreign body, such as a needle, metallic restoration, piece of elevators, piece of forceps, or gunshot. Such a removal is considered a surgical operation. It is not always indicated and is often left up to the judgment and discretion of the dental officer.

Exercises (665):

Identify the procedures performed in the oral surgery section by matching the procedure description in column B to the appropriate procedure name in column A.

Column A

____ 1. Biopsy.
____ 2. Cystectomy.
____ 3. Surgical removal.
____ 4. Extraction.
____ 5. Frenotomy.
____ 6. Tori removal.
____ 7. Foreign body removal.
____ 8. Alveolectomy.

Column B

a. The surgical removal of the tissue that restricts the tongue's movement.
b. Tooth removal that entails tissue incision, excision, or bone removal.
c. The removal of the sharp bony edges that result from a multiple extraction.
d. The removal of abnormal, bony growths from the

Column B

body of the mandible or the maxilla.
e. The removal of a piece of tissue for diagnostic and microscopic examination.
f. The removal of such items as a needle, piece of an instrument, or buckshot.
g. The removal of erupted, diseased, or malposed teeth.
h. The removal of cysts and periapical granulomas.

666. State the correct approach to oral surgery procedures, and describe the elements of the preoperative, operative, and postoperative phases.

Oral Surgery Assisting Duties. Dental patients requiring oral surgical treatment are often more nervous and more apprehensive than those scheduled for other types of dental treatment. Consequently, it is very important that you be a calming influence upon the highly nervous, oral surgery patient. You may exert a calming influence by making sure you complete every action with self-confidence. Patients (particularly oral surgery patients) tend to react to dental operations the same way you and the dental officer react. If you or the dental officer exhibit nervousness, the patient becomes more nervous. On the contrary, if you and the dental officer display calmness, the patient's nervousness seems to subside somewhat. Therefore, you should perform each oral-surgery assisting task in a deliberate, calm, and self-confident manner. The key to self-confidence is preparation. When you become thoroughly familiar with each aspect of your job, self-confidence follows. The accomplished oral surgery assistant is a stabilizing influence to even the most nervous of oral surgery patients.

Preoperative procedures. The actual procedures for chairside assisting during oral surgery cannot be outlined in any step-by-step sequence. Techniques vary from oral surgeon to oral surgeon; however, certain steps are basic to an accomplishment of the preoperative procedure in an efficient manner so that it is bearable by the patient and enhances the final treatment results.

If possible, you should have previously discussed with the oral surgeon the essentials for each type of oral surgery operation. With such preparation, you can be sure to have the necessary instruments, equipment, and materials ready for each patient. Also, asepsis and strict cleanliness are essential for all surgical operations. Since it is not possible to sterilize the oral cavity, you must take steps to avoid the introduction of foreign bacteria (cross contamination), either through the use of unsterile instruments or materials or by being careless in the preparation of your hands. The procedures to be accomplished before the actual operation begins are called preoperative procedures or the preoperative phase as we mentioned earlier.

Patients awaiting oral surgical treatment normally remain in the main patient waiting room. However, in some facilities a small seating area is located just outside the surgery section. If your clinic has one of these areas, make sure that patients awaiting treatment cannot see into the treatment room. Patients who are waiting for surgical treatment are usually more apprehensive than those waiting for other dental care. Most treatment is provided on an outpatient basis (treated and released).

Occasionally, a patient will be presedated (given a sedation drug before the scheduled appointment time). In this case, he should either wait in the clinic recovery room or in a quiet area of the clinic. Be absolutely sure that presedated patients are not left alone. Prior to actually seating the patient in the chair, check to make sure that you left no traces of the previous operation. After you have seated the patient and made him comfortable, have him loosen restricting clothing and make sure that removable prosthetic appliances are taken from his mouth and stored in an appropriate receptacle.

You may be required to perform a full surgical scrub prior to each operation. In any case, the very minimum should be a scrubbing with a handbrush and soap. Mere hand-to-hand lathering and rinsing is simply not enough to satisfy the requirements of oral surgery. After you have completed your scrub, dry your hands on one of the sterile towels that you placed on top of the instrument setup. When you have dried your hands, don the sterile rubber gloves that you will be wearing during the surgical procedure. All of this is done in view of the patient because it helps to reassure him. With gloved hands, you may then drape the patient with a sterile drape. Be sure to exercise care that you don't touch any unsterile object during the draping procedure. After these preoperative procedures have been completed, the operation may begin.

Surgical operative procedures. The variations in dental officers' techniques make it very difficult to outline a uniform procedure to be followed for each surgical operation. However, the following procedures can be followed until you know the desires of the dental officer.

First, the majority of oral surgery procedures require two or more injections of local anesthetic. For this reason, it is a good practice to include two aspirating syringes with each instrument setup. This will permit you to supply a loaded anesthetic syringe to the surgeon for as long as needed with minimum loss of time. Anesthetic solutions are bitter, and leakage from injection sites will require you to aspirate the fluids from the patient's mouth after the injection.

To become an effective oral surgery assistant, you must anticipate the needs and desires of the surgeon. This is not done overnight; however, when the surgeon's sequence of performing an operation is known, you can form a smooth operating team. You should plan ahead and see that the next instrument is available when it is needed. When passing instruments to the surgeon, place them firmly in his hand because gloves reduce tactile feeling, thereby increasing the possibility of his dropping the instrument. This also saves time since the surgeon doesn't have to reach for the instrument he desires. In addition, this procedure contributes to the smoothness and efficiency of the operation.

Aspiration of fluids from the mouth is one of your primary duties during surgical procedures. The hemorrhage produced by surgical procedures, together with the saliva, presents a twofold problem. First, the use of surgical knives, chisels, and rotating instruments makes it imperative that the oral surgeon be able to see what he is doing. Secondly, the accumulation of this blood and saliva in the rear of the patient's mouth tends to excite his gag reflex. For these reasons, the need for constant, comprehensive aspirating cannot be overemphasized. You must aspirate in all areas of the mouth, not just in and around the operative site. By anticipating the oral surgeon's moves, you can aspirate ahead of him. This keeps you from getting in his way.

For irrigation, a container of sterile, distilled water or saline solution and an irrigating syringe should be kept on the instrument tray. The operative site should be periodically flushed to remove blood, saliva, and debris. A Luer-Lok syringe with a curved, blunted needle is very helpful when flushing a tooth socket, particularly when attempting to remove a broken or retained root tip. You can also use the irrigating solution to dampen gauze sponges for moistening the patient's lips throughout the surgical procedure, to clean blood and debris from instruments prior to returning them to the instrument tray, and to clean the patient's tongue and lips at the conclusion of the operation.

Another of your important duties is the careful use of a retractor. The mouth mirror makes an excellent retractor in addition to instruments designed as retractors. Make sure that you have a firm hold on retracted tissue, particularly during procedures such as cutting, drilling, or suturing.

You must stay constantly aware of the patient's physical condition during the entire surgical procedure. If any changes occur, *quietly* point them out to the oral surgeon at once. Always be prepared to lend immediate assistance during an emergency. Under no circumstances should you make a remark on a sudden complication in the procedure. Such remarks tend to excite and further arouse the patient's nervousness. As you might suspect, this could lead to even further adverse patient reaction.

Postoperative procedures. Once the surgical operation is completed, moisten a 2- by 2-inch or 4- by 4-inch sponge and use it to remove all blood from the patient's face. It is also a good idea either to remove the blood-stained instruments and aspirator bottle or to cover them with a towel so that they are not visible to the patient. You may then remove the drape and reposition the chair so that the patient is able to exit easily.

Most oral surgeons have instruction sheets for home care of the mouth following oral surgery. Each patient should receive one of these, along with any medication and gauze recommended by the dentist. When the surgeon has finished with the patient, dismiss him as cordially as he was received after making any necessary future appointments. Closely observe the patient as he is leaving to make sure that he is steady on his feet and shows no signs of distress. If he exhibits any signs of dizziness, detain him until the oral surgeon can evaluate his condition.

Exercises (666):

1. Why is it important that you perform each oral surgery task in a deliberate, calm, and self-confident manner?

2. Considering that it is impossible to sterilize the oral cavity, why is it important to maintain asepsis and strict cleanliness for each oral surgery patient?

3. How can you make sure that you are preparing all of the necessary instruments, equipment, and materials needed for each oral surgery patient?

4. If your clinic has a separate oral surgery waiting room, what view should be obstructed from waiting patients?

5. What should be done with presedated patients prior to seating them in the treatment room?

6. What should you do immediately after seating an oral surgery patient?

7. What is the very minimum of acceptable hand cleaning procedures you should perform in preparation for oral surgery?

8. Should you drape the patient before or after you don your rubber gloves?

9. Why should you include two aspirating-type anesthetic syringes in each oral surgery setup?

10. When passing instruments to the oral surgeon, why must you place them more firmly in his hand than when passing restorative instruments?

11. Why is it important to perform constant, comprehensive aspiration during the surgical procedure?

12. What instruments and materials are needed for surgical irrigation?

13. What may be used to moisten the patient's lips during the surgical procedure?

14. What should you do if you notice a change in the patient's physical condition during the oral surgery procedure?

15. After the oral surgery procedure is complete, what should you do prior to removing the patient's drape?

16. Why should you closely observe the patient when he is leaving?

4-4. Endodontic Section

The endodontic section treats diseases of the dental pulp. Few dental clinics have a dental officer assigned who limits his practice exclusively to endodontics. Usually, one of the operative dentists spends part of his time seeing patients who require root canal therapy. In our discussion of the endodontic section we describe the endodontic procedures that may be performed as well as the basic assisting duties.

667. Supply answers to a series of key questions that serve to describe the two types of endodontic procedures, the materials and instruments required, and the assisting knowledge needed.

There are two specific types of endodontic operations—conservative root canal therapy and the apicoectomy. Let's take a close look at each of these and see what they entail.

Conservative Root Canal Therapy. Conservative root canal therapy is normally effective when the disease of the pulp is fairly well confined to the pulp canal. Usually this treatment is required as a result of a periapical abscess. In most cases of conservative root canal therapy, there is no need for anesthesia since the pulp tissues are dead. The objectives of this therapy are to remove the contents of the pulp canal, clear up the infection, and insert a root canal filling material.

Normally, conservative root canal therapy takes two or more appointments. This is because the infection must be completely cleared up before the canal can be filled. Filling the canal while infective organisms are still present will result in a reoccurrence of the abscess. If the patient is suffering from an acute periapical abscess, he will be experiencing severe pain. The pain is a result of pressure created by the formation of pus and gases in the pulp canal. The pressure and therefore the pain are relieved during the first step of the endodontic procedure. This step is to gain entrance into the pulp canal. Entrance into the pulp canal is gained by drilling directly into the pulp chamber. Once entrance has been accomplished, barbed broaches are used to remove dead pulp tissues from the canal.

During subsequent appointments root canal reamers and files are used to enlarge, shape, and smooth the pulp canal. During these appointments a rubber dam is used to isolate the tooth and to prevent contamination of the root canal. Paper points saturated with an antiseptic are introduced into the root canal to help clear up the infection. Radiographs are taken to ensure the proper reaming and filing of the canal. Cultures are taken to assure that the growth of microorganisms within the canal has ceased. If the results of the culture are negative, then the canal is filled with gutta percha or a silver point and sealed permanently with root canal cement. Followup appointments are usually scheduled periodically for X-rays of the restored tooth.

As in all efficient assisting you should try to anticipate the dental officer's needs. Your function, in the endodontic section consists mainly of aiding in the placement of the rubber dam and taking cultures, mixing materials, and passing instruments and materials. You should know the exact approach your dentist takes toward root canal therapy in order to effectively anticipate his needs.

Apicoectomy. An apicoectomy is the surgical removal of the apex of a tooth. It is sometimes indicated when there is possible cystic involvement. In conjunction with removal of the cystic lesion (cystectomy) the apex of the tooth may also be removed; this is termed an apicoectomy. This procedure is done along with the conservative root canal therapy previously described. The apicoectomy requires teamwork between the dentist and you. Apicoectomies are usually done in the surgery section, and you must, of course, follow the surgical assisting procedures. After the patient has been draped and anesthetized, the dentist makes an incision facially near the involved tooth's apex. He then uses a surgical bur or chisel to remove the overlying alveolar bone. Once the root is exposed, he uses the bur to remove its apex. Curettes are then used to remove infectious material from around the root tip. The canal is then filled and sutures are placed to close the incision. The surgical portion of the apicoectomy is done quickly. The longer the patient is subjected to a surgical procedure, the more likely it is that there will be swelling and discomfort.

Most of the information in this section has been general in nature. Dentists vary a great deal in their techniques. When assigned to assist in endodontics, take time to ask the dentist to brief you on his methods. Then make every effort to learn to fulfill these requirements.

Exercises (667):

1. Why isn't there need for anesthesia in most conservative root canal procedures?

2. What are the objectives of conservative root canal therapy?

3. Why are two or more appointments usually required for conservative root canal therapy?

4. Once entrance into the pulp canal is accomplished, what is used to remove the dead pulp tissues?

5. What is used to isolate the tooth and prevent contamination of the root canal?

6. What instruments are needed to enlarge, shape, and smooth the pulp canal?

7. What is used to introduce an antiseptic into the pulp canal?

8. Why are cultures of the root canal taken?

9. When is it safe to fill the root canal?

10. What may be used to fill the root canal?

11. What must you know to be an effective endodontic assistant?

12. What endodontic procedure is sometimes indicated when there is possible cystic involvement?

13. What is done to the apex of the root during an apicoectomy?

14. During an apicoectomy, how is exposure of the root tip achieved?

15. What is used to remove infectious material from around the root tip?

16. What assisting procedures should you follow during the apicoectomy?

4-5. Periodontic Section

The periodontic section treats diseases involving the supportive structures of the teeth. The treatment of periodontal disturbances may encompass both the dental and medical professions. The patient will be referred to the medical facility for diagnosis and treatment if it is determined that the cause of his periodontal disturbance is due to systemic factors. Within the dental clinic, the treatment of a periodontal patient may require treatment by the entire dental team.

The periodontist may treat periodontal disease by relieving conditions such as traumatic malocclusion; by eradicating periodontal pockets; and by assuring that the patient practices proper oral hygiene, as previously discussed. The oral surgeon performs his service by removing nonrestorable teeth, by making biopsies, and by removing neoplasms. The prosthodontist exercises his role by replacing missing teeth with required appliances. The dentist in the restorative section alleviates periodontal ailments by removing and replacing faulty restorations. The services of the orthodontist may be required to reposition malposed teeth.

668. Stipulate why the eradication of periodontal pockets is important, identify the periodontal procedures, and compare the assistant's role in periodontics to his role in other specialities.

Purpose of Periodontal Treatment. As you know, periodontal disease affects the supportive structures of the teeth. The primary purpose of periodontal treatment is to eradicate periodontal pockets. Why is eradication of the pockets so important?

a. A pocket is an area of food and bacterial accumulation and infection.

b. A pocket creates conditions which lead to caries of the root with subsequent involvement of the pulp.

c. A pocket causes degenerative changes in the gingiva, which increases susceptibility to acute necrotizing ulcerative gingivitis (NUG)

d. Pockets cause degenerative changes in the periodontal ligament, and the inflammation from the pocket walls is a factor responsible for the bone loss in periodontal disease.

e. These pockets are a source of discomfort to the patient during mastication.

Periodontal Procedures. Eradication of the periodontal pocket may include scaling and root planing, curettage, gingivectomy, osseous contouring, and equilibration. You know that these operations are all performed by the dental officer. Even though you do not actually perform these operations, you do have certain duties to perform as you assist the dental officer. These duties may consist of passing the proper instruments, keeping the area clear and clean, or setting up for an anesthetic injection (if used). Therefore, you should be knowledgeable about these procedures:

a. Scaling and root planing. When the dental officer performs deep subgingival scaling and root planing, he occasionally uses local anesthesia. To remove deep deposits of calculus, he must slide an instrument gently along the calculus in the direction of the apex until the termination of the calculus on the root is reached, removing the piece of calculus in its entirety if possible. He then planes the root surface until it is smooth. In root planing, any softened material must be removed until firm tooth substance is reached and smoothed.

b. Curettage. Curettage consists of removing the necrotic and degenerated tissue lining the gingival wall of the periodontal pocket. This procedure reduces the periodontal pocket by removing a barrier to reattachment of the periodontal ligament to the root surface. The dentist performs the curettage by using the curette instruments. Local anesthetic is normally needed for this procedure.

c. Gingivectomy. This term means excision of the gingiva. The procedure is a method of periodontal pocket eradication. In practice, the gingivectomy is normally a two-stage operation, consisting of removal of the diseased gingiva and the scaling and root planing of the root surface. The gingivectomy may be used to treat any of the following conditions: deep suprabony pockets (between tooth crown and alveolar bone crest), infrabony pockets (between alveolar bone crest and apex of tooth), periodontal abscesses, furcation involvement (areas between roots), gingival enlargement, and gingival defects. This procedure is usually accomplished on one quadrant at a time; however, some dental officers prefer to treat both quadrants on the same side of the mouth at one visit.

d. Osseous contouring. Osseous contouring is the surgical reshaping of bone to eliminate deformities and create physiologic bone contours. This operation is indicated when the dental officer believes the bone deformities will interfere with proper oral hygiene and gingival massage. Osseous contouring is most often performed with diamond stones; however, bone files, rongeurs, chisels, and large round burs may be used. When the dental officer uses burs and stones, you usually assist by bathing the proper area in a stream of warm water or isotonic saline to minimize injury to the bone from frictional heat.

c. *Equilibration.* An equilibration may be indicated when malocclusion causes any of a variety of periodontal conditions. This procedure normally requires that study casts be made to determine where the occlusion must be adjusted. An equilibration is the adjusting of the occlusal contact areas between the upper and lower teeth so that each tooth carries its equal share of the occlusal load. Then, the dental officer uses mounted stones to grind and adjust the contact areas between the upper and lower teeth. The dental officer may perform an equilibration in conjuction with other periodontal therapy—or as a separate procedure.

Assistant's Role in Periodontics. Your duties in this section are similar to those of other sections, in particular, oral surgery. Keep in mind that the periodontist has several variations of treatment of periodontal disease. To properly discharge your duties, you have to know which instruments and treatment packs the periodontist desires. You should have all instruments and supplies needed for the particular periodontal treatment set up prior to the arrival of the patient. The method of receiving the patient and adjusting the chair and your duties after dismissal of the patient are the same in the periodontal section as those discussed in the chapter dealing with basic assisting procedures. You also must irrigate and aspirate the operation area during periodontal surgical procedures. Still another important assisting duty is to mix, manipulate, and store surgical dressing materials. Frequently, the periodontic assistant also schedules all appointments for the periodontic section.

Exercises (668):

Some of the facts listed in items 1 through 8 are important reasons why periodontal pockets should be eradicated; some are not. Stipulate those that are important reasons with a T (true) and those that are not with a F (false).

____ 1. Periodontal pockets are the primary cause of systemic diseases.
____ 2. A periodontal pocket is an area of food and bacterial accumulation and infection.
____ 3. Periodontal pockets create conditions that could cause caries of the root and subsequent involvement of the pulp.
____ 4. Periodontal pockets result in the loss of nutritional food values and often lead to malnutrition.
____ 5. Periodontal pockets can be a source of discomfort to the patient during mastication.
____ 6. Periodontal pockets contain large quantities of harmful and predominantly aerobic bacteria.
____ 7. Periodontal pockets cause degenerative changes in the gingiva which increase susceptibility to NUG.
____ 8. Periodontal pockets cause degenerative changes in the periodontal ligament, and the inflammation from the pocket walls is a factor responsible for the bone loss in periodontal disease.

In items 9 through 13 identify the the periodontic procedures by matching the description in column B to the procedure in column A.

Column A

____ 9. Gingivectomy.
____ 10. Scaling and root planing.
____ 11. Equilibration.
____ 12. Curettage.
____ 13. Osseous contouring.

Column B

a. The procedure that consists of removing the necrotic and degenerated tissue lining the gingival wall of the periodontal pocket.
b. This method of pocket eradication is accomplished by the excision of the gingiva.
c. The surgical reshaping of bone to eliminate deformities and create physiologic bone contours.
d. The adjusting of the occlusal contact areas between the upper and lower teeth so that each tooth carries its equal share of the occlusal load.
e. Performed to remove deep deposits of calculus and to smooth the root's surface.

14. To what section are the duties of the periodontal assistant similar?

4-6. Prosthodontic Section

Prosthodontic dentistry deals with the substitution or replacement of oral structures. Prosthodontic dentistry can include anything from replacing one missing tooth to the construction of an intricately designed device to replace missing structures in a cleft palate. Most prosthodontic treatments are concerned with replacing missing teeth. You will recall from previous chapters that teeth are lost for many reasons. The older patient may lose some or all of his teeth because of advanced periodontal disease, whereas the younger patient is more likely to lose his from advanced caries, contact sports, or a collision with a well-placed fist. The replacement of these missing teeth requires the skill of the prosthodontist. You form part of the "prosthodontic team." In this section your assisting duties are very similar to those of other sections in the dental clinic. The primary differences are the type of treatment being performed, the material that you mix or manipulate, and the instruments that are used.

669. State the examination requirements for each new prosthodontic patient, indicate why

.403

radiographs are necessary, and specify the factors that influence scheduling.

Patient Requirements. Each new prosthodontic patient requires a type 1 examination, including complete oral radiographs. The dental officer will make diagnostic casts when indicated. He uses the radiographs to diagnose cysts, residual roots, unerupted teeth, impacted teeth, periodontal conditions, caries, bone density, or other conditions requiring operative or surgical correction before prosthodontic treatment is started. The diagnostic casts reveal irregularities of the occlusion that must be corrected before prosthodontic treatment is initiated. These casts also reveal irregularities that will be a factor in determining the type of appliance to be constructed. In planning prosthodontic treatment, all oral surgery, and periodontic, endodontic, and restorative treatment should be completed before prosthodontic treatment is initiated.

Appointment Scheduling. Most prosthodontic cases require a series of appointments. It's usually your duty as the prosthodontist's assistant to schedule these appointments. Two basic factors influence the scheduling of prosthodontic patients. These factors are the procedures to be accomplished during the appointment and the laboratory time required between appointments. These factors will, of course, dictate the time allocation for which you should schedule the patient, and the date on which you schedule the patient.

You must understand the procedure being carried out and know the varying amounts of time that must be allowed for laboratory work between visits of a patient. Never hesitate to ask the dental officer and coordinate with the laboratory concerning time allocation for various procedures so that the dental officer's and laboratory technician's time is efficiently utilized.

Exercises (669):

1. What type of examination is required for each new prosthodontic patient?

2. How are full-mouth radiographs used by the prosthodontist?

3. How are diagnostic casts used by the prosthodontist?

4. What are the factors that influence the scheduling of prosthodontic patients?

5. How can you help assure that the dental officer's and laboratory technician's time is efficiently utilized?

670. State the function of a full denture, name the materials from which it is fabricated, and specify the procedures and assisting duties involved during its fabrication.

Prosthodontic Procedures and Assisting Duties. Prosthodontic treatment is primarily concerned with replacing missing teeth with some type of artificial substitute. These substitutes for the natural teeth are called prosthodontic appliances. Normally, there are four groups of prosthetic appliances: dentures, crowns, inlays, and special maxillofacial appliances. The procedure and sequence of clinical steps described below are general in nature, and these vary with the individual dental officers and the specific requirements of the patient.

Although the basic clinical steps for prosthodontic procedures are essentially the same in all clinics, the sequence of steps and of materials required varies with the individual dental officer and the specific requirements of the patient. Many dental officers combine or omit steps according to the needs of each case. Thus, you must be prepared to render the required assistance at the proper time and in the desired manner. Although a particular technique of one prosthodontist may vary from that of another, variations are easily mastered, provided you are familiar with the general procedures and materials used.

Complete or full dentures. A complete denture is an appliance that replaces the full number of teeth in the arch. This appliance is fabricated from acrylic with porcelain or acrylic teeth. On the first appointment the dental officer will take maxillary and mandibular preliminary impressions. He will also record information and directions on AF Form 519, Dental Prosthetic Case Record. This form was discussed in another volume. Although several impression materials are suitable, the first impression is often taken with cake compound. This softened compound is placed in an impression tray and pressed against the oral tissues by the dental officer. The bottom of the tray may be sprayed with cool water until the compound hardens, after which the impression is withdrawn. You then take the impression to the laboratory so that the impression may be poured and a custom tray may be constructed for the next appointment.

Your duties during the first appointment may include all or part of the following:

(1) Soften the compound in the compound heater, following the manufacturer's directions.

(2) Place petroleum jelly on the patient's lips and around his mouth to prevent materials from sticking to his skin.

(3) Chill the compound in the mouth with cold water as the dental officer holds it in place.

(4) Perform routine assisting duties and assist the dental officer as directed.

(5) Initiate AF Form 519, and AF Form 644.

The second appointment is used to obtain a final impression. This impression is taken in an individual impression tray constructed in the laboratory from the preliminary casts. The individual tray may be made of acrylic resin, shellac baseplate, or special tray material. The impression material used is usually one of the "wash" types, usually zinc oxide paste or plaster. The final impressions are taken to the laboratory, and the master casts are poured. Occlusion rims are then constructed on a baseplate that the laboratory has adapted to the master casts. Your duties during this second appointment are as follows:

(1) Coat the area around the patient's mouth with petroleum jelly so that the impression material will not adhere to the skin.

(2) Mix the impression material. If you use zinc oxide paste, mix it on a parchment pad. If you use plaster-type impression material, mix it in a rubber bowl.

(3) Perform routine duties and assist as directed.

(4) Add applicable information to AF Form 519 and fill out AF Form 644 for the patient's visit.

(5) Take the final impression to the laboratory.

The third appointment is used for interocclusal relationship. The dental officer establishes and records several measurements of the patient, such as centric relation, vertical dimension, and the occlusal plane. This is accomplished by placing the baseplate and occlusal rim and using a sharp instrument to mark the relationship on the wax occlusal rim. The baseplates and the occlusal rims are then placed back on the master casts. The case is now returned to the dental laboratory. Laboratory personnel now mount the casts on an articulator, set up the artificial teeth in the wax occlusal rim, and trim the wax until it resembles a denture. Your duties during the third appointment are as follows:

(1) Aid the dental officer as required in recording interocclusal relationships.

(2) Assist as directed.

(3) Add applicable information to the patient's AF Form 519.

(4) Return the occlusion rims to the laboratory so that the teeth may be set up.

(5) Fill out AF Form 644.

The purpose of the fourth appointment is to try the waxed-up trial dentures in the patient's mouth. This is done to check appearance, functional relationship, and other measurements. The trial dentures are sent to the dental treatment room from the laboratory on the master casts to prevent warpage. Since the teeth are set up in wax for the try-in, they may be moved about by the dental officer, if necessary, for both esthetics and function. Your duties during the fourth appointment are as follows:

(1) Obtain the trial dentures from the laboratory.

(2) Assist as directed.

(3) Add applicable information on the patient's AF Form 519.

(4) Fill out AF Form 644.

(5) Return the trial dentures to the laboratory so that the dentures may be processed and finished.

The fifth appointment is the final one in the production of complete dentures. This appointment is used by the dental officer to insert the completed denture in the mouth and make final corrections. He also instructs the patient on the proper care and wearing of the dentures. Your duties for the final appointment are as follows:

(1) Obtain the completed dentures from the laboratory.

(2) Assist as directed.

(3) Make proper entries on AF Form 519; AF Form 644; and SF 603, Dental Health Record.

Exercises (670):

1. State the function of a full denture and name the materials from which it is fabricated.

2. What is accomplished during the first full denture appointment?

3. What are your duties in regards to the compound impression material during the first appointment for a full denture?

4. Why should you place petroleum jelly on the patient's lips and around his mouth?

5. What is the purpose of the second appointment for full denture fabrication?

6. What type of impression is usually used for the final full denture impression?

7. What functions are performed by the dental laboratory personnel between the second and third appointment for full denture fabrication?

8. What is the purpose of the third appointment for full denture fabrication?

9. What functions are performed by the dental laboratory between the third and fourth full denture appointments?

10. What is the purpose of the fourth appointment for full denture fabrication?.

11. What is the purpose of the fifth appointment for full denture construction?

671. State the function of a removable partial denture, name the materials from which it is fabricated, and specify the procedures and assisting duties involved during fabrication.

Removable partial dentures. A removable partial denture is an appliance replacing less than the full number of teeth in one arch. These appliances are fabricated from gold, chrome-cobalt, or acrylic, with porcelain or acrylic teeth. A thorough examination, including a full set of radiographs, is performed before the partial denture is started. Study casts are made when indicated. This preliminary examination is made for the same reasons as the preliminary examination for a full denture. Another reason is to determine where the rest preparations must be prepared in the teeth. A rest preparation is a cut on the surface of a tooth made by the dental officer to accommodate the occlusal or incisal rest of a removable partial denture.

The first appointment for a removable partial denture is used to prepare rest preparations in the teeth to be used as abutments (a tooth upon which the clasp is placed to retain, support, or stabilize a removable partial denture). It is also used to take impressions of the hard and soft structures of both arches of the mouth. After the dental officer prepares rest seats on the abutment teeth, the patient's teeth are cleaned and polished (all debris removed) before the impressions are taken. One of the elastic impression materials (usually alginate hydrocolloid) is used for the impression. The material is placed in a rimlock, perforated, or individual impression tray. After the dental officer withdraws the impressions from the patient's mouth, they should be taken to the laboratory to be poured up as soon as possible to prevent distortions caused when the impression material dries out. A stone (hydrocal) mix is used to pour the impression, and occlusion rim(s) will be constructed on the master cast. The master casts are sent to an area dental laboratory (ADL) to have the metal framework constructed. Your duties will include the following:

(1) Clean and polish the patient's teeth (when required).
(2) Mix and prepare the impression material according to the manufacturer's instructions and place it in the impression tray.
(3) Assist as directed by the dental officer.
(4) Prepare AF Form 519 and AF Form 644.
(5) Take the impressions to the laboratory.

The second appointment is used to establish and record the relationship between the maxillary and mandibular arches. The dental officer establishes the centric relationship with the occlusion rim(s) placed in the patient's mouth. In some cases, the metal framework of the partial denture will be used to construct occlusion rim(s). The tooth shade and mold will also be obtained at this time. Your duties during the second appointment include the following:

(1) Obtain the occlusion rims from the laboratory.
(2) Assist as directed.
(3) Make proper entries on AF Form 519 and AF Form 644.
(4) Return the case to the laboratory for the final fabrication.

The purpose of the third appointment is to insert the completed removable partial denture. The dental officer inserts the completed denture in the mouth and makes necessary adjustments. In making adjustments he may contour the framework, clasps, etc. He will also instruct the patient on proper care and wearing of the dentures. Your duties during the insertion appointment include the following:

(1) Assist the dental officer as directed.

(2) Return the denture to the laboratory for polishing after alterations have been made.

(3) Make proper entries on AF Form 519 and SF 603.

Exercises (671):

1. State the function of a removable partial denture and name the materials from which it is fabricated.

2. What is accomplished during the first appointment for the fabrication of a removable partial denture?

3. What type of impression tray should you choose if an alginate impression is being taken?

4. Why should the impression be taken to the laboratory as soon as possible after it has been removed from the patient's mouth?

5. What procedures are accomplished in the dental laboratory between the patient's first and second appointments for a removable partial denture?

6. What is accomplished during the second appointment for a removable partial denture?

7. What is the purpose of the third appointment for a removable partial denture?

672. Identify the types of crowns and inlays, state their purpose, and trace the steps required for their fabrication.

Crowns and inlays. Artificial crowns replace all or part of the coronal portions of a tooth and may be constructed of gold, porcelain, acrylic, or a combination of these materials. There are several types of crowns as described below:

(1) Complete veneer crown. This crown covers the entire coronal portion of an anterior tooth and is constructed of acrylic or porcelain.

(2) Partial crown. This crown covers three or more, but not all, surfaces of the coronal portion of a tooth, usually the mesial, lingual, and distal.

(3) Veneered metal crown. The veneer crown is a gold crown, the facial surfaces of which are covered with a porcelain or acrylic shell.

(4) Thimble or coping crown. This is a porcelain or acrylic crown or jacket that is placed over a gold casting or platinum shell.

(5) Full gold crown. This is a crown, constructed completely of gold, restoring the coronal portion of a tooth.

Inlays are cast restorations that are fabricated, usually in gold, to correspond with the form of a cavity and then cemented into the cavity. They may also be made of porcelain or plastic. Inlays are grouped into five classes which are numbered I to V according to the surfaces of the tooth restored:

a. Class I. These restorations include the occlusal surface of a bicuspid or molar (and sometimes the facial or lingual surface of other teeth)

b. Class II. These restorations include the occlusal surface combined with either the mesial or distal surface, or both.

c. Class III. These restorations are limited to the mesial or distal surface of an anterior tooth not involving the incisal edge.

d. Class IV. These restorations involve the mesial or distal surface of an anterior tooth involving the incisal edge.

e. Class V. These restorations are confined to the facial or lingual surface.

The fabrication and placement of gold crowns and inlays follow sequential steps. First, of course, the tooth is prepared, then the dental officer may construct the wax pattern of the crown or inlay in the mouth; this is called the direct technique. Or he may use the indirect technique and take an impression of the prepared tooth in a copper band or crown and bridge tray filled with a suitable impression material, such as rubber base. If the direct method is used, the wax pattern is used by the laboratory for investing and casting. If an impression is taken, the impression is poured to make a die (positive reproduction), and a wax pattern is constructed on the die. Next, this pattern is placed on a sprue, put in a casting ring, and imbedded in an investment (heat-resistant gypsum) material (see fig. 4-1). This process is called investing. When the investment material hardens, the sprue is removed. The casting ring is placed in an oven and the wax is then burned out to form a mold. The casting ring is then placed in the casting machine and molten metal is cast into the mold to form the crown or inlay. A temporary restoration or crown is placed on the tooth to protect it until

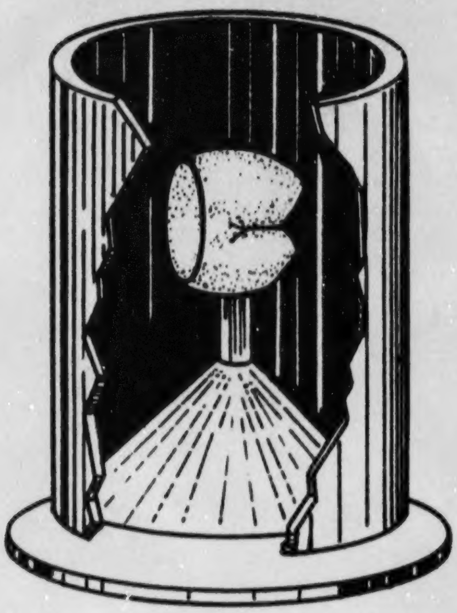


Figure 4-1. Invested crown.

the permanent restoration is completed. Your duties during the first appointment are as follows:

(1) Cool the tooth with water during the cavity or tooth preparation or manipulate the suction apparatus to keep a clear field.
(2) Mix impression materials.
(3) Help prepare temporary restorations or crowns.
(4) Take the impressions or wax pattern to the laboratory.
(5) Complete appropriate administrative work.

The second appointment is used to cement or seat the crown or inlay onto the tooth preparation. The dental officer tries the crown or inlay in the patient's mouth. He then makes any necessary alterations, after which he cements it into place. He will use the crown and bridge cement that he prefers. Your duties during the insertion appointment include the following:

(1) Mix the cement.
(2) Assist as directed.
(3) Complete appropriate administrative work.

Exercises (672):

In items 1 through 10 identify the types of crowns and inlays by matching the description in column B to the type of restoration in column A.

Column A	*Column B*
___ 1. Class V inlay.	a. A cast restoration that includes the occlusal surface combined with either the mesial or distal surface, or both.
___ 2. Partial crown.	b. A gold crown, the facial surface of which has been covered with a porcelain or acrylic shell.
___ 3. Class II inlay.	c. A cast restoration that is confined to the facial or lingual surface.
___ 4. Thimble or coping crown.	d. An acrylic or porcelain crown that covers the entire coronal portion of an anterior tooth.
___ 5. Class IV inlay.	e. A cast restoration that is limited to the mesial or distal surface of an anterior tooth not involving the incisal edge.
___ 6. Full gold crown.	f. A porcelain or acrylic crown that is placed over a gold casting or platinum shell.
___ 7. Complete veneer crown.	g. A crown that covers three or more, but not all surfaces of the tooth's coronal portion.
___ 8. Class I inlay.	h. A cast restoration that includes the occlusal surface of a bicuspid or molar.
___ 9. Class III inlay.	i. Constructed completely of gold and restoring the coronal portion of a tooth.
___ 10. Veneered metal crown.	j. A cast restoration including the mesial or distal surface of an anterior tooth involving the incisal edge.

11. Briefly describe the events that occur chairside during the first appointment for a crown or inlay using the direct technique.

12. Briefly describe the events that occur chairside during the first appointment for a crown or inlay using the indirect technique.

13. If an impression is taken, upon what is the wax pattern constructed?

14. Briefly describe how the wax pattern is converted into a metal crown.

15. What is accomplished during the second crown or inlay appointment?

16. State the purpose of crowns and inlays.

673. State the function of a fixed partial denture, name the materials from which it is fabricated, and answer a series of key questions that serve to indicate the steps (other than those involved with crowns and inlays) required in its fabrication.

Fixed partial dentures (bridge). A fixed partial denture is an appliance permanently fixed to abutments (a tooth that supports a fixed partial denture) with inlays or crowns which cannot be removed by the patient. It is usually fabricated from gold and may have porcelain or acrylic facings. The missing teeth are replaced by pontics. A pontic is a gold artificial tooth suspended from one or more abutments of a fixed partial denture. Veneered acrylic or porcelain facing may be attached to the pontic for esthetics. A fixed partial denture that has an abutment only on one side is called a cantilever bridge.

The fabrication and insertion of a fixed partial denture are also carried out in sequential steps. The dental officer prepares the abutment teeth for crown or inlays, and impressions are taken. Dies are made from the impression. A wax pattern is made on the dies by the dental laboratory technician or by the dental officer. The wax patterns are invested, burned out, and cast by the laboratory technicians. The inlays or crowns are placed on the teeth, and an impression is taken of the entire arch with the castings in place. The impression is poured up with a special soldering investment. The pontic is then stabilized in its proper position with soldering investment. The pontic is then attached to the castings with gold solder, and the castings with the attached pontic are finished, polished, and cemented into place in the mouth. This procedure is usually accomplished in three appointments. Your duties are similar to those of other procedures previously discussed in this chapter.

Exercises (673):

1. Briefly describe a fixed partial denture.

2. What is a pontic?

3. What is a fixed partial denture called that only has an abutment on one side?

4. What procedures are accomplished to properly position and attach the pontic to the abutment castings?

674. Given a series of statements concerning special maxillofacial appliances, indicate which are true and which are false.

Special maxillofacial appliances. In addition to the prosthodontic appliances already discussed, there are a few others of which you should be aware. These appliances, while not rare, are infrequently seen in USAF dental clinics. Since you probably will not be involved in the fabrication process of these appliances during your AF career, we will discuss them only in general terms:

a. Bite-raisers. Bite-raisers are appliances designed to increase the vertical dimension of the occlusion. This type of prosthodontic appliance is generally indicated for patients who have gradually lost vertical dimension from wear, loss of teeth, or temporomandibular joint problems. Because of the difficulties involved in establishing a balanced occlusion with this type of appliance, it is a common practice to first make a temporary removable appliance of acrylic resin. After the patient has worn the temporary appliance long enough to determine its effectiveness, a permanent appliance is constructed of metal.

b. Obturators. Obturators are appliances designed to close the unnatural opening between the mouth and nasal cavity of patients having cleft (partially split or divided) palate. Ideally, the obturator should fully restore the functions of the tissue it replaces. The palatal portion of the prosthesis should also restore the resonance necessary for distinct speech.

c. Splints. Splints may be used to either provide anchorage for pressure applied in reducing a fracture or to hold the bone in proper alignment after it has been reduced by other means. In addition to their use in treating fractures, splints are sometimes used during periodontal treatment to temporarily stabilize mobile teeth during the healing process. Normally, impressions of both arches are made so that when the splint is fabricated, it will not interfere with normal occlusion.

Exercises (674):

Indicate whether the following statements concerning maxillofacial appliances are true (T) or false (F) by circling the appropriate T or F.

T F 1. Appliances used to close unnatural openings between the mouth and the nasal cavity are called bite-raisers.

T F 2. An obturator should restore the resonance necessary for distinct speech.

T F 3. When preparing a fracture splint it is only necessary to take an impression of the arch being splinted.

T F 4. The function of a bite-raiser is to increase the vertical dimension of occlusion.

T F 5. In addition to their use in treating fracture, splints may also be used to stabilize mobile teeth during periodontal treatment.

T F 6. Bite-raisers are always constructed from a dental metal.

675. Name the types of denture repairs and state the purpose and procedure for relining or rebasing dentures.

Repairing, Relining, and Rebasing Dentures. In addition to the fabrication of new prosthodontic appliances, service must also be provided for appliances that are in use. As with the original fabrication, the bulk of the work is usually performed in the dental laboratory. We begin our discussion of these procedures with repairing dentures.

Repairing. Many different types of broken complete dentures, removable partial dentures, or fixed partial dentures may be brought into your clinic. In practically all cases, repair is possible. The dental laboratory has the capability to replace fractured or missing artificial teeth, to mend fractures of the acrylic denture base material, and in some cases to restore damaged frameworks to their original condition. From the clinical viewpoint, you may think of the needed repairs as being of two types: (1) repairs that can be made in the laboratory without an impression or (2) repairs that require an impression. Impressions are not usually needed if an anterior tooth is to be replaced or if the pieces of the fractured denture base material fit firmly and unmistakable into their original position. If a posterior tooth is being replaced, impressions of both arches are usually necessary so that the laboratory can grind the tooth into the proper occlusion. If denture base material is fractured to the extent that it is difficult to establish the exact original relationship of the material, usually an impression of that single arch is taken. An impression permits repair to be made on an accurate cast of the patient's mouth. The dental officer will instruct you as to the type of impression material required and the type of tray to be used for each case.

Relining and rebasing. Mouth tissues that support dentures undergo a certain amount of shrinkage over a period of time. This change may be seen as a loss of vertical dimension, a deviation from centric occlusion, or a loosening of the denture. To correct these conditions the dental officer may reline or rebase the denture.

A *reline* is accomplished when the denture becomes loose in the mouth and the dental officer decides that the difficulty can be remedied with a new lining or refitting. To do this, the dentist makes an impression inside the denture. In other words, he uses the denture as his impression tray. The laboratory then substitutes new acrylic for the impression material, and the relined denture is inserted in the patient's mouth. The occlusion is usually adjusted at this time.

Rebasing consists of replacing the entire denture base with new material. This procedure is similar to the reline procedure. If the dental officer decides to rebase the denture, the clinical steps are the same as for a reline impression. The actual fabrication is done in the laboratory. When it is returned to the clinic for insertion, it is handled much the same as a new denture.

Exercises (675):

1. Thinking from the clinical viewpoint, what are the two types of denture repairs?

2. What type of denture repair procedure would normally require impressions of both the upper and lower arches?

3. What causes the need for relining or rebasing dentures?

4. What is used as the impression tray for relines or rebases?

5. Where are the actual relining or rebasing procedures accomplished?

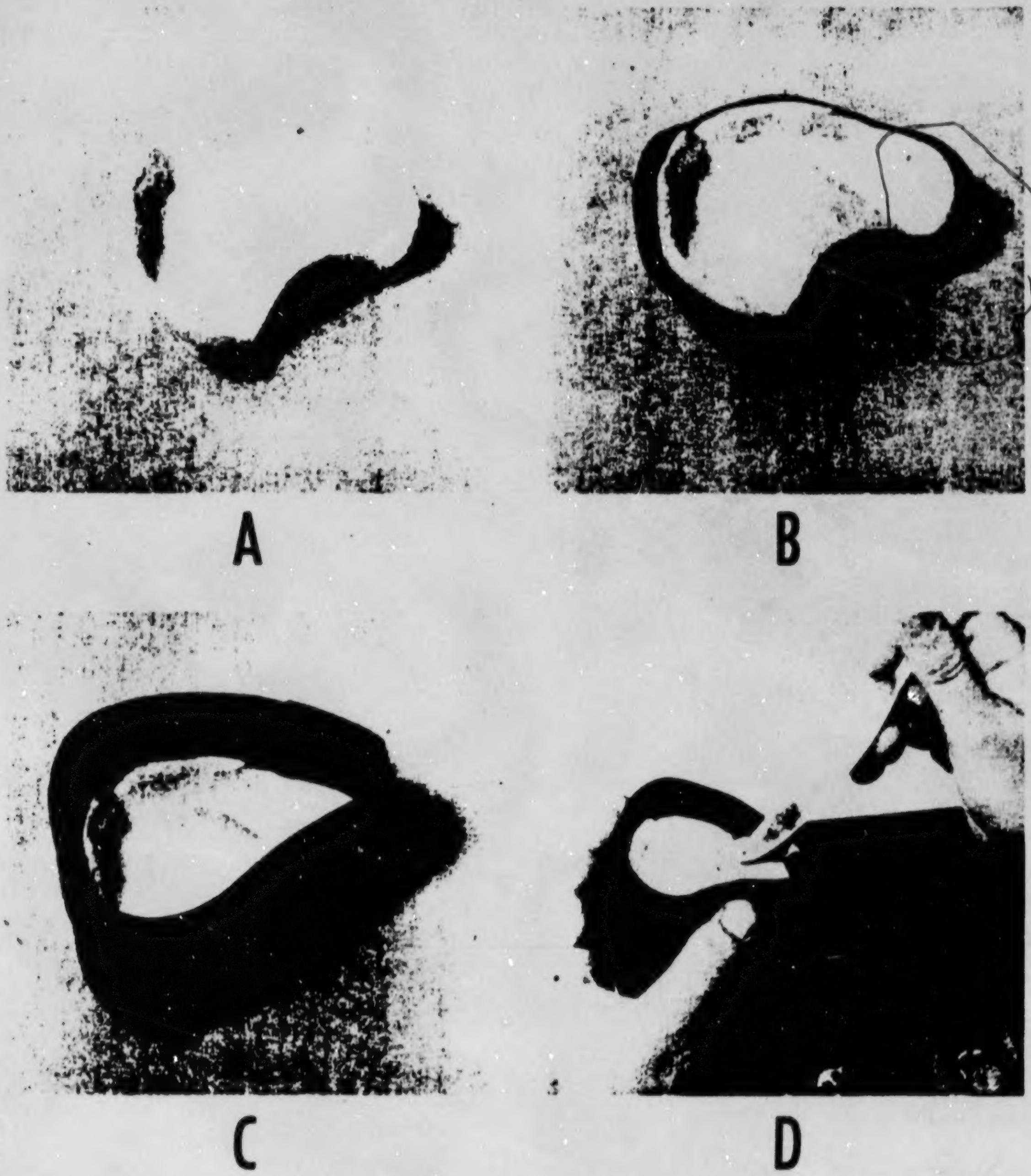


Figure 4-2. Boxed method of pouring a cast.

676. Name the methods, specify the materials, and describe the procedures involved in pouring casts.

Pouring and Trimming Casts. The tasks of pouring and trimming casts are frequently misconstrued as being solely the responsibility of dental laboratory personnel. Whereas these tasks are a responsibility of dental laboratory personnel, they are also levied against the dental specialist. There are times when the only dental laboratory specialist is on leave status or has begun a laboratory procedure that requires his full attention for a few minutes. Since most impressions tend to distort because of dehydration or room temperature variations, you must pour them right away. Further,

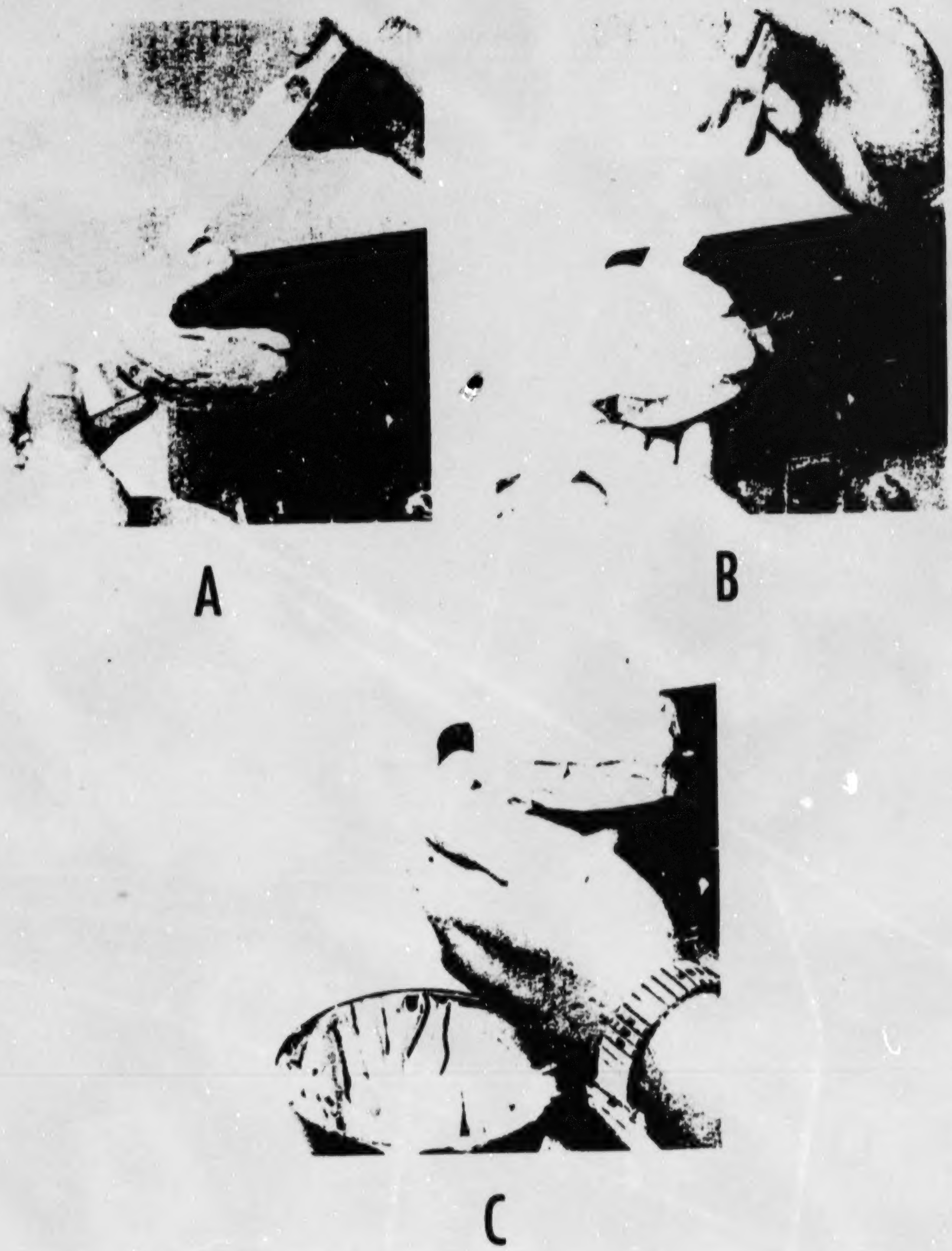


Figure 4-3. Upright method of pouring a cast.

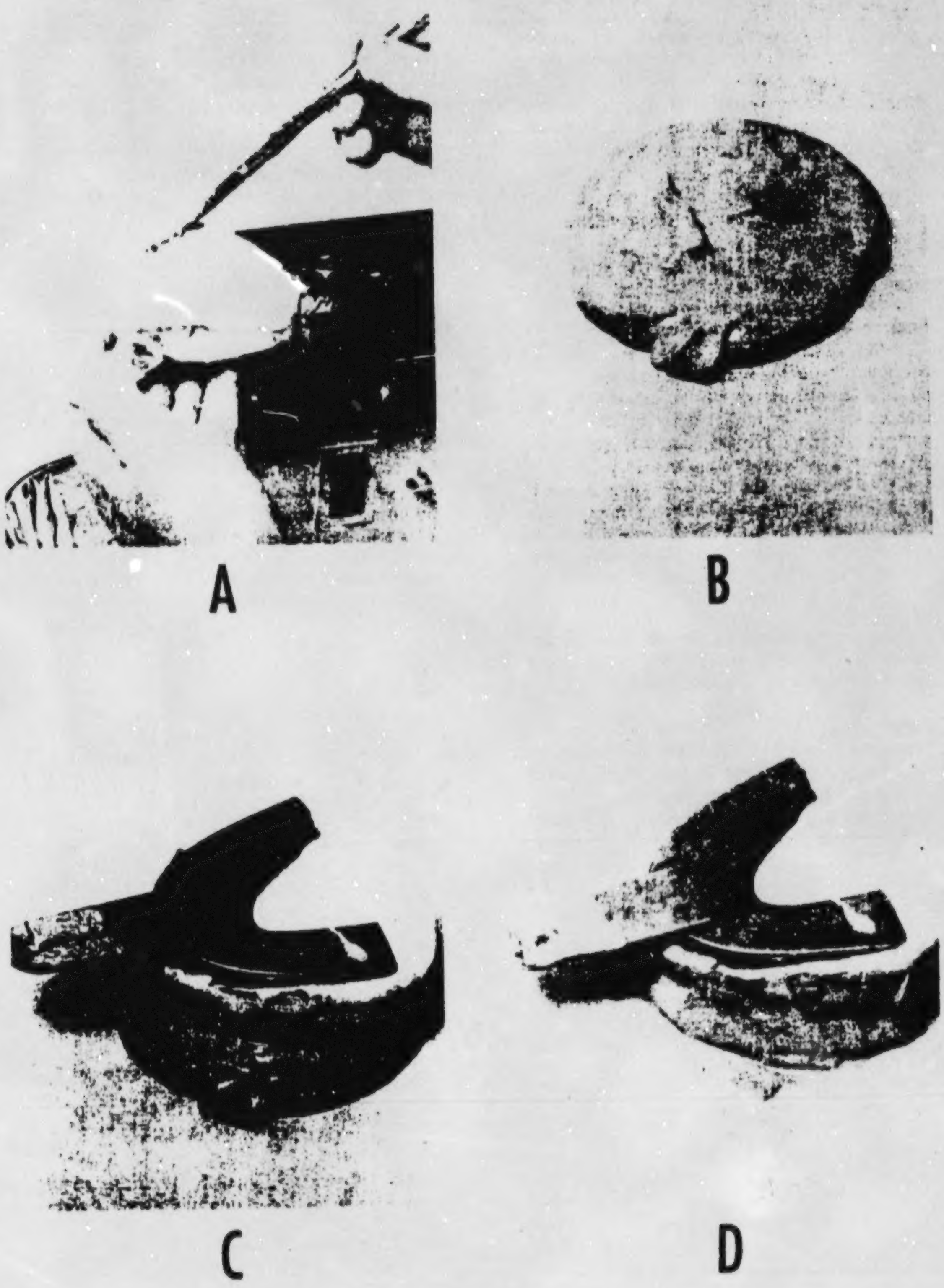


Figure 4-4. Two step method of pouring a cast

your dental officer may sometimes give you specific instructions as to how he wants you to trim a cast. Thus, this too may become your responsibility.

Pouring casts. One of the keys to producing a desirable cast is using a properly mixed gypsum product. Most impressions are poured with a mix of plaster of paris, hydrocal (dental stone), or minor variations of these. To assure a good cast mix, you should adhere to the following:

a. Always use a clean mixing bowl and spatula.

b. Always add the powder to the water, never the water to the powder.

c. Spatulate thoroughly, incorporating all of the powder evenly throughout the mix.

d. Avoid whipping the mix, which will cause the final product to have excessive air bubbles.

e. Help eliminate air bubbles from the mix by occasionally jarring the bowl against the bench top, by holding the bowl on the vibrator for a few moments, and by subjecting the final mix to a vacuum, mixer-investor machine (used to mix gypsum products and to eliminate air bubbles).

f. Never add water to a mix that is too thick, because this interferes with the setting mechanism.

g. Whenever possible, use mechanical spatulation in preference to hand mixing.

Once you have the desired mix, you are then ready to use one of three methods of pouring a cast—the boxed, upright, and two-step methods.

The boxed method is generally considered the best method for the inexperienced cast pourer. However, the boxed method is very difficult to use when pouring agar or alginate impressions. The reason for the difficulty is the beading (bordering the outermost limits of the impression with utility wax) requirement. The utility wax does not adhere very well to agar and alginate materials. Impressions made with impression compound and custom acrylic trays are comparatively easy to bead and box for pouring.

For illustrations of the boxed method, see figure 4-2, parts A, B, C, and D. Part A shows a typical maxillary edentulous impression. Part B shows the impression after the beading has been accomplished with utility wax. The beading is to be applied at about 3 millimeters below the height of the peripheral (outward boundary) roll and extended across the posterior border. Part C shows the impression after the beading and boxing wax has been applied. The boxing is now complete and the impression is ready to pour. Part D shows the boxed impression being poured with dental stone. Note the vibrator which helps to eliminate air bubbles and also aids in making the stone flow to fill in voids and low spots.

The boxed method is the best method to insure that all peripheral borders are complete. The next method for pouring an impression is the upright method.

The upright method of pouring impressions is commonly used by experienced laboratory personnel. For the beginner, this method makes it difficult to control the thickness and the shape of the final cast. However, in experienced hands, the upright method saves time and produces an accurate cast. As the method name implies, the impression must remain in an upright position throughout the pouring and remain in this position until the plaster or stone hardens.

Figure 4-3, parts A, B, and C, shows the usual steps in pouring an edentulous mandibular impression. Part A shows dental stone being vibrated into the tooth areas of the mold. Part B shows dental stone being vibrated into the area that forms the floor of the mouth. Notice that a tongue spacer has been placed in the inner horseshoe area of the impression tray. Wet paper, asbestos, wax or any other suitable material may be used to construct the tongue spacer. Part C shows that stone has been added to build the model to the desired thickness. The base is also flattened and smoothed.

As we mentioned earlier, the remaining method of pouring impressions is the two-step method. As the method name states, there are two steps in pouring an impression when using the two-step method. Actually, the two-step pouring method requires two mixes of either hydrocal or plaster of paris.

Figure 4-4, parts A, B, C, and D, illustrates the two-step method. Part A shows the impression being poured to a level slightly above the height of the impression walls with dental stone. Note also that the surface of the stone is left rough. Part B shows that the second mix of dental stone has been formed into a patty. Part C shows that the impression containing the hardened initial mix is inverted onto the patty formed by the second mix. The soft second mix is then shaped to form the base of the model, as shown in part D.

Exercises (676):

1. Why must impressions be poured as soon as possible?

2. What gypsum products are used to pour impressions?

In items 3 through 8, identify the true statements concerning the mixing of gypsum products with a T and the false statements with an F.

____ 3. Whenever possible, use mechanical spatulation in preference to hand mixing.

____ 4. Use a clean bowl and mixing spatula.

____ 5. Whip the mix to insure the complete incorporation of all powder particles.

____ 6. Always add the water to the powder.

____ 7. Help eliminate air bubbles from the mix by jarring the bowl against the bench top or by holding it on the vibrator.

____ 8. If the mix appears too thick, you should add a little water.

9. Name the method of pouring impressions in which you invert the impression containing the hardened initial mix onto the patty formed by the second mix.

10. Name the method of pouring impressions in which you employ dental waxes to form a matrix for the gypsum product.

11. Name the method of pouring impressions in which the impression remains in the upright position throughout the pouring and in which the stone is added, smoothed, and flattened to build the model to the desired thickness.

12. What materials may be used to construct a tongue spacer when pouring mandibular impressions?

13. When pouring impressions, what equipment is used to help eliminate air bubbles and to aid in making the stone flow to fill voids and low spots?

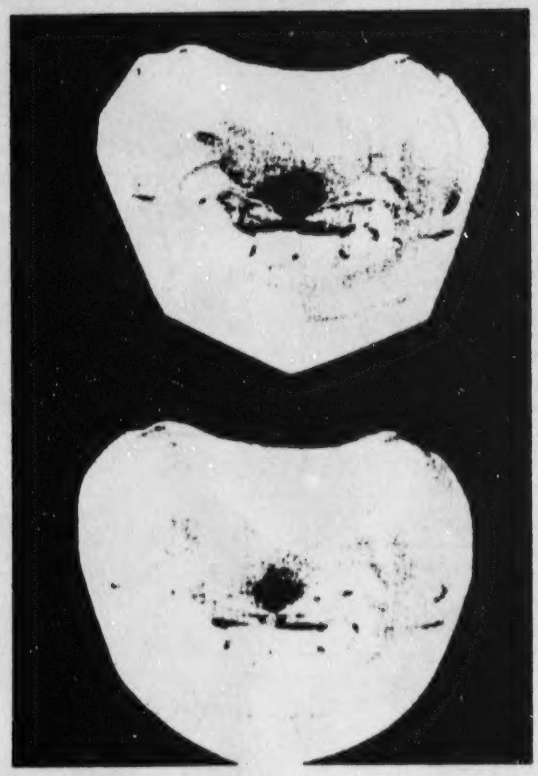


Figure 4-5. Cast trimming examples.

677. Name the equipment used to trim casts, specify the desired cast configuration after trimming, and describe the two methods of trimming.

Trimming casts. Except for casts produced by the boxed method of pouring, there is a requirement to trim down the rough and excess portions of the cast base. Even some boxed impression casts have a base that is too thick or has irregular surfaces which need smoothing. You may be thinking that minor irregular surfaces or a cast base that is only slightly too thick should cause little or no concern. Basically this can be true, but the dental profession believes that we should "always put our best foot forward" for psychological advantage. Consequently, we should always be "neat conscious" about everything the patient might see in the dental treatment room. From this viewpoint then, it is very important that dental casts present a neat, attractive appearance.

In practically all cases, you trim dental casts on a machine called a model trimmer. This electrically operated machine is equipped with a 10-inch abrasive wheel, a small worktable, and a water-dispensing mechanism to keep the abrasive wheel rinsed clean. The worktable is located near the access opening to the abrasive wheel. This

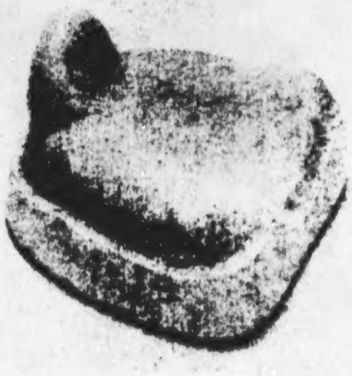


Figure 4-6. Acrylic impression tray.

worktable is usually adjustable to permit trimming a model at nearly any angle.

To trim a cast you should probably mark it with trimming lines beforehand. These lines should be made to determine the base thickness; to align the base plane to the occlusal plane of the teeth; and to trim the outer boundary alongside the posterior teeth, the anterior teeth, and the posterior border of the cast. If the occlusal plane of the teeth is not parallel with the plane of the cast base, you should trim the base until it is parallel. Normally, the base should be from 3/8- to 1/2-inch thick. The outer boundary alongside the teeth should be trimmed up to the outermost edge of the peripheral (vestibular mucosa) roll. There are two general ways of trimming alongside the periphery. One way is to follow the contour completely around the peripheral boundary. The other way is to trim the outer peripheral boundary in four straight lines. These lines generally run from the third molar area to the cuspid on either side of the model and from the cuspid to the midline on either side of the cast. The posterior border should be trimmed so that the highest point does not exceed the occlusal plane level. See figure 4-5 for examples of casts trimmed in these two ways.

Exercises (677):

1. Name the equipment that is usually used to trim casts.

2. Normally, how thick should the base of the trimmed cast be?

3. How close to the teeth should the outer boundary of the cast be trimmed?

4. Briefly describe the two methods of trimming alongside the periphery.

678. State the use of custom impression trays, and answer a series of key questions that serve to describe the methods and procedures involved in the tray's construction.

Fabricating Custom Impression Trays. Many dental officers (especially prosthodontists) prefer to have custom impression trays made for use in taking final (detailed) impressions. These trays may be fabricated from baseplates (thick shellac sheets), impression compound, or acrylic. Probably the most common type of material used for fabricating impressions is the self-curing resin (acrylic). See figure 4-6 for a typical acrylic impression tray.

There are generally two ways used to make acrylic impression trays—the dough and the sprinkle methods. Before adapting the tray material, you must coat the cast with a suitable separating medium, such as tinfoil or alginate solution (sodium or potassium alginate in distilled water). When using the dough method, you mix the acrylic (powder and liquid) until the mix reaches the dough stage and then mold it with your hands into a fairly thin wafer. You may then adapt the wafer to the cast. Use some of the same material to form a handle on the anterior part of the tray. To use the sprinkle method, you must also have a model coated with a separating medium. The tray making then begins by first sprinkling the acrylic powder (polymer) over the cast and next adding enough liquid to saturate the powder. This procedure is continued until the tray is of uniform and adequate thickness. Usually custom impression trays are only fabricated for patients needing a full denture or full dentures.

Other factors to consider when fabricating custom impression trays are blocking out cast undercuts, adding spacers, and perforating the trays. If the cast you are to use has deep undercuts, you must remember to block them out before adapting the acrylic. Failure to do so will result in a damaged cast or tray when you attempt to remove the hardened (set) tray. You may block out (fill in) the undercut areas with baseplate wax or modeling clay. Some dental officers prefer to use impression trays which have had spacing provided. By spacing, we essentially mean to provide a tray that is larger than the cast. To meet this requirement, first adapt a sheet of baseplate wax to the cast before adapting the acrylic. Some dental officers also prefer to have custom trays perforated. Perforations serve to provide escape areas for the impression material, which minimizes tissue displacement, and to provide retention of the impression material to the

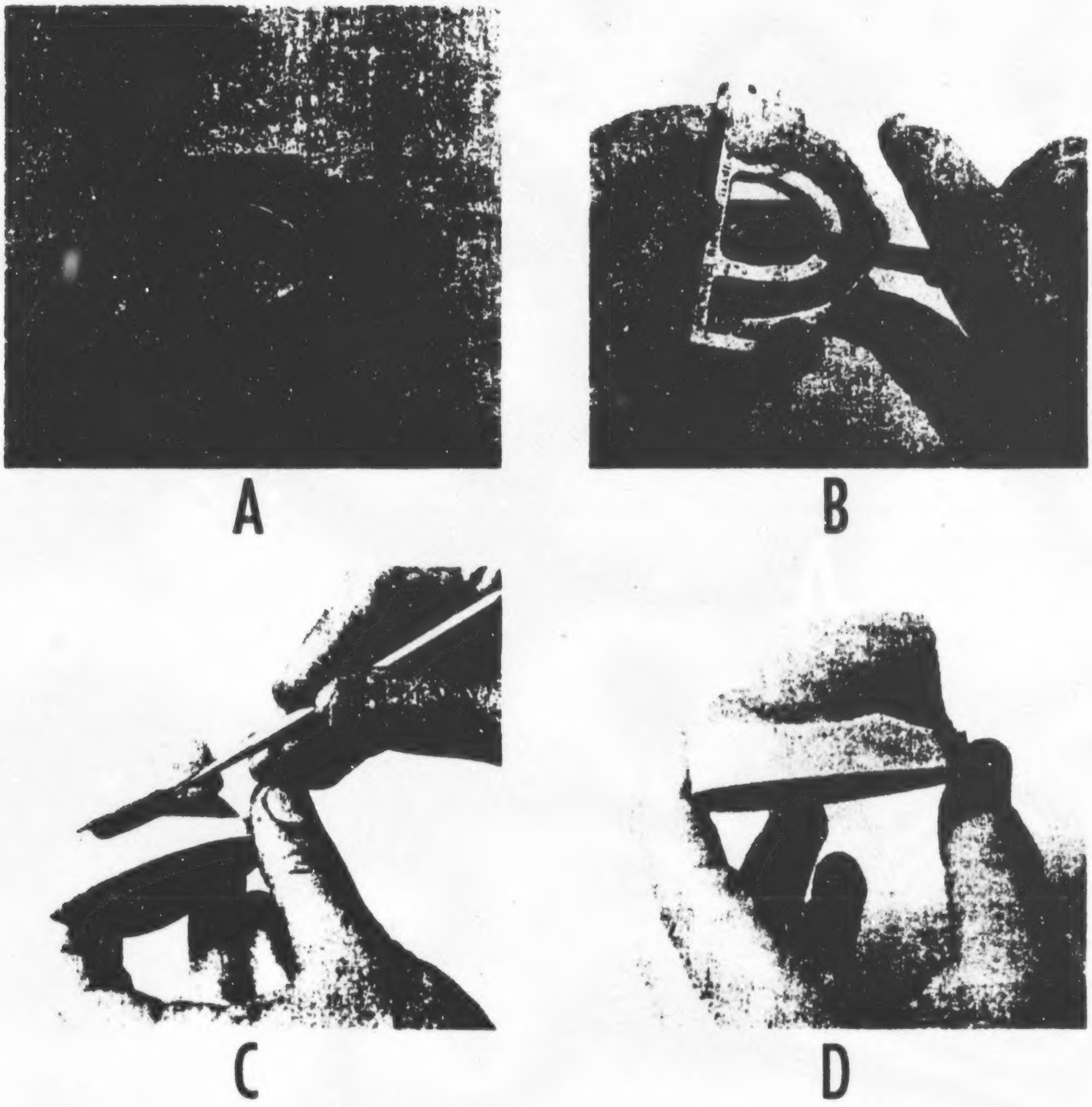


Figure 4-7. Making and adapting bite rim to baseplate.

tray. Before fabricating a custom impression tray, it is good policy to ask your dental officer what provisions he desires in the tray and make it accordingly.

Exercises (678):

1. How are custom impression trays used?

2. What is the most common material used for custom tray construction?

3. What are the two methods of making acrylic impression trays? Briefly describe each method.

4. Why is it necessary to block out undercuts when constructing a custom impression tray?

5. How can you block out undercut areas of the cast?

6. If the dental officer prefers to have an impression tray with spacing, how can you provide this spacing?

7. What purpose could be achieved by perforating a custom tray?

679. Give the definition of "biting relationships," and answer a series of key questions concerning the procedures required for constructing baseplates and bite rims.

Baseplates and Bite Rims. After the final impression has been poured and the "master cast" has been separated from the impression, the next requirement is to obtain the correct biting relationships. To get these biting relationships, the dentist uses baseplates and bite rims. By biting relationships, we are referring to the patient's vertical biting depth, the occlusal plane, the midline, the contour and fullness of the lips and cheeks, etc. Your role in this regard is to construct the baseplate and bite rim and combine the two. The first step is to construct the baseplate.

Baseplate. Before adapting the baseplate to the cast, immerse the cast in slurry water (water containing dissolved hydrocal) for a few minutes. The slurry water will act as a separating medium. The baseplate is then adapted to the cast by first being sure it is centered and then using an alcohol torch or Bunsen burner to apply heat and soften the baseplate. With sufficient heat, the shellac resin baseplate may be easily adapted to the cast by using light finger pressure. (CAUTION: To prevent possible burning of your fingers, dip them in water before touching the heated baseplate.) Excess baseplate material may be trimmed with a pair of crown and bridge scissors. Any remaining rough edges may be eliminated by using a heated wax spatula or by using an arbor band (abrasive band on a rubber wheeled mandrel). At times, baseplates need reinforcement. Paper clips can be easily shaped, heated, and embedded into the baseplate (especially mandibular baseplates) for reinforcement purposes.

Most dental officers prefer to have the inside of these baseplates lined with a material which reproduces a close resemblance of the detail shown on the master cast. Such detail cannot be obtained in adequate quality with the baseplate material. The quality desired is called *stabilizing*. The stabilizing quality is acquired by using baseplate wax or a final impression wax. Once again, the master cast must be soaked in slurry water before the stabilizing material is added. The wax (baseplate wax) is added by heating the wax until it is in a liquid state, then dipping the soaked cast in the wax. The baseplate is then quickly readapted over the wax. The result is a baseplate lined with wax. Final impression materials may also be added to the baseplate and adapted to the cast to obtain the stabilizing effect.

Bite rims. Bite rims are usually constructed with baseplate wax. They may be formed by hand or a two-piece former may be used for this purpose. To form bite rims using the former, you should heat a sheet of baseplate wax until it is in a semiliquid state, assemble the bite rim former and place it on a flat surface (glass slab or metal bench top), and press the wax into the former, as shown in figure 4-7,A. Once the wax has cooled to the solid state, any excess should be removed with a knife, as shown in figure 4-7,B. The former may then be disassembled and the bite rim removed. You may then adapt the formed bite rim to the stabilized baseplate by using an alcohol torch, heated wax spatula, and more baseplate wax to act as a bonding material, as shown in figure 4-7, parts C and D. If you are forming the bite rim by hand, heat a sheet of baseplate wax until surface melting is apparent; then quickly roll the wax into a cylinder shape. Next, bend the wax cylinder into a horseshoe that coincides with the occlusal surface of the baseplate. Attach the bite rim in the same manner as was previously described, and use a compound knife and wax spatula to properly shape the bite rim.

Exercises (679):

1. What is meant by biting relationships?

2. What is used to obtain the correct biting relationships?

3. Why should the cast be immersed in slurry water before the baseplate is adapted to the cast?

4. Briefly describe how the baseplate is adapted to the cast.

5. What can easily be used to reinforce baseplates?

6. Briefly describe how you stabilize the baseplate with baseplate wax.

7. What material is used to construct the bite rim?

8. What is used as the bonding material for attaching the bite rim to the baseplate?

9. Briefly describe how the wax is shaped when you fabricate the bite rim without aid of the two-piece former.

quality protein, riboflavin, vitamin A, and many other nutrients.
605 - 4. c. Nursing mothers, b. children age 9 to 12, a. children under age 9.
605 - 5. Protein.
605 - 6. The bread-cereal group.
605 - 7. Diets high in sugar or carbohydrates.
605 - 8. Nuts, carrot sticks, and fruits.

606 - 1. The use of preventive measures against diseases of the mouth.
606 - 2. The development of severe periodontal conditions.
606 - 3. c.
606 - 4. f.
606 - 5. a.
606 - 6. d.
606 - 7. e.
606 - 8. b.
606 - 9. The facial surfaces of the maxillary molars and lingual surfaces of the mandibular incisors.
606 - 10. Gingival recession.

607 - 1. T.
607 - 2. F.
607 - 3. T.
607 - 4. T.
607 - 5. F.
607 - 6. T.
607 - 7. T.
607 - 8. F.
607 - 9. T.
607 - 10. T.
607 - 11. T.
607 - 12. T.
607 - 13. F.
607 - 14. T.

608 - 1. To remove calculus from the tooth surfaces.
608 - 2. To eliminate the source of irritation to the periodontium.
608 - 3. The amount of calculus in the patient's mouth.
608 - 4. The cavitron.
608 - 5. Manual hand instruments.
608 - 6. Pen, modified pen, and palm grasp.
608 - 7. The palm grasp.
608 - 8. T.
608 - 9. F.
608 - 10. F.
608 - 11. T.

609 - 1. F.
609 - 2. F.
609 - 3. F.
609 - 4. T.
609 - 5. F.

610 - 1. Lower; heart.
610 - 2. Mouth mirror.
610 - 3. Weight; legs.
610 - 4. Good posture; back straight.

611 - 1. To rehabilitate and educate the patient toward improved oral hygiene.
611 - 2. So that you don't needlessly injure the tooth or its surrounding tissue.
611 - 3. By frequently irrigating the scaling site.
611 - 4. Too vigorous a retraction can be extremely uncomfortable to the patient.
611 - 5. Dull instruments produce inadequate results, waste time and effort, and are hard to control.
611 - 6. Place them in the order they are going to be used.
611 - 7. Use colored tape.
611 - 8. The patient could easily lose confidence in you.
611 - 9. To prevent blood or debris from the instruments or your hands from staining the patient's clothing.

612 - 1. Disclosing.
612 - 2. Gingival sulcus.
612 - 3. Your sense of touch.
612 - 4. Rough flintlike.
612 - 5. The concave grooves leading into the furcation areas of multirooted teeth.

613 - 1. F.
613 - 2. T.
613 - 3. T.
613 - 4. F.
613 - 5. F.
613 - 6. T.
613 - 7. T.
613 - 8. F.
613 - 9. T.
613 - 10. T.
613 - 11. T.
613 - 12. F.

614 - 1. Polishing is accomplished to remove stains and plaque, and to smooth the enamel.
614 - 2. Hand instruments.
614 - 3. Hydrogen peroxide or stannous fluoride.
614 - 4. A rubber cup attached to a prophylaxis or conventional speed contra-angle handpiece.
614 - 5. Rotate the polishing cup at a slow speed, use light pressure, and keep the cup moving over the tooth's surface.
614 - 6. The rotation of the cup can sling the polishing material out of the patient's mouth.
614 - 7. Waxed.
614 - 8. It does not leave a wax residue and generally does a better job since its fibers can spread and cover more of the tooth's surface.
614 - 9. Since overhanging restorations are a prime source of gingival irritation, you should call them to the attention of a dental officer or make a note on the patient's record so they can be promptly corrected.

615 - 1. 100 g.
615 - 2. Flavoring.
615 - 3. 2, 3.
615 - 4. Professional supervision; self-use.
615 - 5. Prophylaxis.
615 - 6. Highest.
615 - 7. Equal; distilled water.
615 - 8. 30 seconds.
615 - 9. Eat; drink; rinse their mouth.
615 - 10. 6, 12.

616 - 1. e.
616 - 2. b.
616 - 3. d.
616 - 4. c.
616 - 5. a.

617 - 1. It serves to motivate the patient to improved oral hygiene by letting him see what is living in his mouth.
617 - 2. A glass slide, a glass slide coverslip, some normal saline solution, a sterile instrument or some floss, a cotton roll, a gauze sponge, and coverslip cement.
617 - 3. The sulcus area.
617 - 4. (1) Obtain the scraping, (2) place a drop of saline on the glass slide, (3) break up the scraping in the saline, (4) place the coverslip over the saline, (5) press the coverslip down with a cotton roll, (6) blot with cotton roll or gauze sponge, and (7) seal the sides of the coverslip with lacquer.

ANSWERS FOR EXERCISES

CHAPTER 1

Reference:

600 - 1. The objectives of the USAF Preventive Dentistry Program are to: (1) Prevent the occurrence, progression, and recurrence of oral disease. (2) Assist eligible patient categories to establish a healthy oral environment. (3) Teach each eligible member how to maintain a healthy oral environment.

600 - 2. The clinical and community health phase.

600 - 3. All dental personnel.

600 - 4. Trained dental hygienists or preventive dentistry technicians.

601 - 1. The elements of the USAF Preventive Dentistry Program are items b, c, d, e, g and i.

601 - 2. To insure the currency of dental health classification, early detection of oral disease, and proper updating and maintenance of the dental health record.

601 - 3. Plaque control techniques, home care, the use of adjunctive oral hygiene devices, diet and nutrition, and the interrelationship of preventive dentistry to general dental health.

601 - 4. A thorough oral prophylaxis should include the removal of plaque, polishing of the teeth, application of an anticariogenic agent, and a preventive dentistry counseling.

601 - 5. AFR 162-2, *Preventive Dentistry Program for Children.*

601 - 6. A type 3 dental examination, an oral prophylaxis including the topical application of anticariogenic agent, an oral hygiene demonstration and lecture, handouts of approved oral health literature, and a preventive dentistry kit.

601 - 7. When the patient is located outside the United States or in one of the areas inside the United States designated as remote for dental care purposes.

602 - 1. To complement the clinical phase by promoting good oral health habits in the Air Force community.

602 - 2. Bases where children are in residence, and where approval has been obtained from Headquarters USAF.

602 - 3. The average daily air temperature in the northern areas is lower and as a result the water intake of the inhabitants is also lower. Therefore, a higher concentration of fluoride is required to provide the desired quantity.

602 - 4. To improve the oral health habits of the Air Force community through the judicious use of ethical publicity.

602 - 5. It should be repeated at intervals throughout the year.

602 - 6. Oral health displays, posters, handouts, military radio and television, base newspaper articles, and group health talks.

602 - 7. Overt or implied endorsement of the commercial product.

602 - 8. The American Dental Association.

602 - 9. The base dental surgeon.

602 - 10. The principal items required for good oral hygiene namely, the toothbrush and unwaxed dental floss.

602 - 11. During National Children's Dental Health Week.

602 - 12. No.

603 - 1. It is to remove the accumulations of trapped food and plaque from around the teeth.

603 - 2. The total oral hygiene effort the patient accomplishes.

603 - 3. Toothbrushes, dentifrices, dental floss or tape, interdental stimulators, and irrigating devices.

603 - 4. A straight-handled toothbrush that has a small flat bristled head.

603 - 5. To disclose the normally invisible deposits of plaque.

603 - 6. A "jiggling scrubbing motion."

603 - 7. Your tongue.

603 - 8. Those containing fluoride.

603 - 9. To remove plaque from between the teeth.

603 - 10. Because it does not leave a wax residue on the teeth.

603 - 11. Press it against the tooth and move it gently down into the gingival crevice. The floss should form the letter "U" as it adapts to the tooth's contour. Now slide the floss up and down to clean the tooth's proximal surface.

603 - 12. To massage the gingiva.

603 - 13. A periodontal patient.

603 - 14. The removal of debris from the gingival sulcus that has been loosened with the brush or floss.

604 - 1. Vegetable-fruit, milk, meat, and bread-cereal.

604 - 2. Protein for growth and repair of the body; minerals and vitamins for growth and to keep the body functioning properly. Fats and carbohydrates for energy.

604 - 3. c. Active teenagers or adults; a. pregnant or nursing women; and b. small children.

605 - 1. Vitamin C is needed for healthy gums and body tissues. Good sources of this vitamin are grapefruit, oranges, cantaloupe, raw strawberries, broccoli, Brussels sprout, green peppers, sweet red peppers, guava, mangos, and papaya.

605 - 2. Vitamin A is needed for growth, normal vision, and a healthy condition of the skin and other body surfaces. The dark green and deep-yellow vegetables are usually rich in vitamin A.

605 - 3. Milk is our leading source of calcium, which is needed for bones and teeth. It also provides high-

617 - 5. How to operate the fine tuning adjustment so he can focus it to his eyes.

618 - 1. You should have checked items b, c, e, f, g, and i.

CHAPTER 2

619 - 1. Areas of the teeth and surrounding structure that cannot be seen in a mouth-mirror and explorer examination.
619 - 2. The dentist can view the bone loss and follow the progression of the disease.
619 - 3. To determine if the canal is reamed and filed to the proper length. They are used postoperatively to insure that the canal is properly filled.
619 - 4. To determine the location of fractured root tips and to verify the complete removal of such root tips.

620 - 1. d.
620 - 2. a.
620 - 3. f.
620 - 4. c.
620 - 5. e.
620 - 6. b.

621 - 1. The cathode and the anode.
621 - 2. The tungsten target, copper head, and copper stem.
621 - 3. The tungsten filament and molybdenum cup.
621 - 4. When low voltage current heats the tungsten filament to incadescence.
621 - 5. When high voltage current is passed through the X-ray tube.
621 - 6. They give up their kinetic energy, which reappears or is converted to X-rays and heat.
621 - 7. A high degree of vacuum.
621 - 8. The relatively high voltage across the anode and cathode.
621 - 9. X-rays produced by high voltage are referred to as hard radiation. They have shorter wavelengths and therefore higher penetration power.

622 - 1. F.
622 - 2. F.
622 - 3. T.
622 - 4. F.
622 - 5. T.
622 - 6. F.
622 - 7. T.

623 - 1. The walls are adequately shielded to prevent X-rays from passing through them and exposing personnel in adjacent areas.
623 - 2. Away from the tube head; out of the line of the useful beam; and behind an adequately shielded protective barrier.
623 - 3. A leaded rubber apron.
623 - 4. It is never permissible.
623 - 5. To protect personnel in areas near the exposure room from unnecessary exposure to X-radiation.
623 - 6. Commercially available skulls.
623 - 7. Damage to the tube head could result in leakage of radiation.
623 - 8. To measure whole body radiation.
623 - 9. A message so stating is quickly dispatched to the originating environmental health service. This usually triggers a comprehensive investigation.
623 - 10. Exposing a film badge to direct sunlight, radiant heat, or other types of radiation could affect the highly sensitive film used in the film badge.
623 - 11. Filtration serves to filter out poor quality long wavelength radiation that is not of any diagnostic value.
623 - 12. Collimation reduces the useful beam to a $2^{3}/_{4}$-inch diameter at skin surface. This drastically reduces unnecessary exposure to the patient's eye and throat area.

624 - 1. Periapical film.
624 - 2. Toward the occlusal or incisal surface; to prevent it from obstructing the view of the apical regions.
624 - 3. Bitewing film.
624 - 4. A general view of the maxillary or mandibular arch.
624 - 5. To allow for different developing times.
624 - 6. Pedodontic.
624 - 7. They may be used to obtain a panoramic view of the oral structures and to view specific facial bones, sinuses, or the temporomandibular joint.
624 - 8. The screen fluoresces when exposed to X-rays. This provides a more intense exposure of the film without increasing the exposure time.
624 - 9. An emulsion consisting of silver halides in a gelatin.
624 - 10. A latent image.
624 - 11. The film must be immersed in chemicals that cause a reaction that transforms the exposed silver halides into black metallic silver.
624 - 12. Intermediate (medium fast type B) and ultraspeed (super type D).
624 - 13. The film is sandwiched between black protective paper, which in turn is backed by lead foil. These contents are enveloped by a lightproof, waterproof packet.
624 - 14. It prevents secondary radiation from fogging the film.
624 - 15. Because it is not packaged in individual lightproof packets.
624 - 16. In a cool, dry place away from any chemicals. If stored in or near the exposure room, it should be kept in lead-lined containers.
624 - 17. On edge.

625 - 1. It is to direct the X-ray beam perpendicular to an imaginary plane that bisects the recording plane of the film and the long axis of the tooth.
625 - 2. Approximately 8 inches.
625 - 3. By placing the tip of the short cone against the patient's skin surface.

626 - 1. Prior to patient entry.
626 - 2. The milliamperage and exposure time.
626 - 3. The kilovoltage.
626 - 4. The manufacturer's instruction on the specific film you are using.

627 - 1. c.
627 - 2. b.
627 - 3. a.
627 - 4. The median sagittal plane should be vertical, and the tragus corner of the mouth line should be parallel to the floor.
627 - 5. The median sagittal plane should be vertical, and the ala-tragus line should be parallel to the floor.

628 - 1. Because of the variations in the anatomical structures.
628 - 2. This could crack the film's emulsion or distort the radiographic image.
628 - 3. Sliding the film over the mucous membrane could cause the patient to gag.
628 - 4. Horizontal.
628 - 5. By the patient using his thumb or finger to press the

film packet firmly against the teeth being radiographed.

628 - 6. This insures recording the whole crown on the radiograph and allows the film to be mounted without obstructing the dentist's view.

628 - 7. a. Second and third molars.
b. First and second bicuspids and the first molars.
c. Cuspid and lateral incisor.
d. Central and lateral incisors.

628 - 8. (1) Coat the patient's soft palate and uvula with a spray-type anesthetic; (2) have the patient breathe through his nose or hold his breath; (3) have him concentrate intently on an object in his view; (4) have him close his eyes and concentrate on a pleasant subject; and (5) suggest he mentally count backwards from 100.

628 - 9. Gagging is a psychological defense mechanism, and such a suggestion could trigger the patient's gag reflex.

628 - 10. By having the patient bite down firmly on the tab.

629 - 1. An elongated image.
629 - 2. A foreshortened image.
629 - 3. It should be directed at an imaginary line that bisects the angle formed by the long axis of the tooth and the recording plane of the film packet.
629 - 4. An overlapping image.
629 - 5. The ala-tragus line.
629 - 6. One-fourth inch above the lower border of the mandible.
629 - 7. b.
629 - 8. c.
629 - 9. d.
629 - 10. a.

630 - 1. (1) g. (2) a. (3) e.
630 - 2. (1) a. (2) b. (3) a.
630 - 3. (1) f. (2) b. (3) g.
630 - 4. (1) c. (2) a. (3) f.
630 - 5. (1) e. (2) b. (3) d.
630 - 6. (1) b. (2) b. (3) c.
630 - 7. (1) d. (2) a. (3) b.
630 - 8. (1) h. (2) a. (3) e.

631 - 1. To direct the X-ray beam perpendicular to the recording plane of the film, which has been positioned parallel to the long axis of the tooth.
631 - 2. It minimizes dimensional distortion and presents the objects being radiographed in their anatomical relationship and size.
631 - 3. 16 to 20 inches. With the longer focal (target) film distance enlargement of the image is reduced.
631 - 4. It must be increased.

632 - 1. To establish a parallel relationship between the film packet, the structures to be radiographed, and the tube head.
632 - 2. No.
632 - 3. d.
632 - 4. b.
632 - 5. a.
632 - 6. f.
632 - 7. c.
632 - 8. e.
632 - 9. The shielded or printed side of the packet.
632 - 10. Hold the right-angled portion of the indicator rod anterior to the block and away from the film. Insert the pins into the proper holes. Slide the locator ring onto the indicator so that it is in front of the film packet.

633 - 1. Vertically.
633 - 2. c.
633 - 3. b.
633 - 4. d.
633 - 5. a.
633 - 6. The locator ring.
633 - 7. The extension tube of the X-ray unit.
633 - 8. Place a cotton roll in the space normally occupied by the crowns of the missing teeth.

634 - 1. To reveal the presence of caries in the crowns of teeth, particularly early lesions on the interproximal surfaces.
634 - 2. The median sagittal plane must be vertical and the ala-tragus line horizontal.
634 - 3. The film packet should be placed so that its greatest dimension lies in a horizontal plane, parallel with the long axis of the crown of the teeth. The forward edge of the film packet should be placed behind the distal one-third of the cuspid teeth. The patient should have his teeth closed down on the bite tab to hold the film in position.
634 - 4. The central ray should be directed toward the occlusal plane at the center of the packet. The pointer should read about 8° below the centerline for the proper vertical angulation. Proper horizontal angulation is obtained by sighting through the maxillary second bicuspid-first molar contact area.

635 - 1. Many oral conditions from a cross-sectional aspect.
635 - 2-8. You should have checked items #3, #4, #6, and #8.

636 - 1. T.
636 - 2. T.
636 - 3. F.
636 - 4. T.
636 - 5. F.

637 - 1. c.
637 - 2. a, d.
637 - 3. c, f.
637 - 4. b, c, e, f.
637 - 5. b.
637 - 6. a.
637 - 7. d.
637 - 8. e.
637 - 9. d, f.
637 - 10. c.

638 - 1. They may be used to obtain a panographic view of the patient's teeth and their surrounding structure or to view a specific bony area where an abnormality is suspected.
638 - 2. The X-ray head and the cassette of the unit rotate around the patient.
638 - 3. Because there is some degree of distortion with all panographic radiographs.
638 - 4. By having the patient hold the cassette against the structure to be radiographed and by directing the central ray toward the cassette from the opposite side of the patient's head.

639 - 1. Because the films used in X-ray work are very sensitive to white light.
639 - 2. It should be completely lightproof; if the entrance way is a door, it should have an inside lock; if the entrance is a maze, it should have enough turns to keep out all light; it should have adequate ventilation.
639 - 3. Unwrap a film under the safelight's illumination. Put an object on the film and place it beneath the safelight for 1 minute; then process the film. If the

profile of the object is visible on the processed film, the illumination is not safe.

639 - 4. It is a corrosion- and rust-resistant tank that has three compartments. The two smaller compartments are provided for the developer and fixer solution; the larger compartment contains water.

639 - 5. It can be partially controlled by the hot and cold water supply. After the water is in the tank, a refrigeration unit maintains the proper temperature. If the processing tank is not equipped with a refrigeration unit, the incoming pipes should lead to a mixing valve that will regulate the water flow.

639 - 6. You unwrap the film and feed it into a slot on the automatic developer. A conveyor system transports the film through the developing chemicals and turns out the processed film in about 5 minutes.

639 - 7. The interval timer.

640 - 1. To provide a way of identifying which patient's films are on which rack.

640 - 2. The unwrapping and placement of the film onto the processing rack.

640 - 3. Tiny air bubbles may form on the film's surfaces and if left uncorrected, portions of the film go underdeveloped. This problem can be prevented by agitating the rack immediately after you place it in the developing solution.

640 - 4. 4½ minutes at 68° F.

640 - 5. The left-hand section.

640 - 6. The left-hand section since the developing time is most critical.

640 - 7. The silver halides, in the film's emulsion, that were affected by the X-rays are converted to black metallic silver by the developer solution.

640 - 8. When it becomes a dark brown color.

640 - 9. Move the film to the center (water) section of the processing tank and agitate the film for 15 to 30 seconds for the purpose of rinsing off all traces of the developer solution.

640 - 10. The right-hand portion.

640 - 11. 10 minutes.

640 - 12. At least 20 minutes.

640 - 13. 100° F.

641 - 1. They should be mounted in the same sequence as the teeth appear in the mouth and for viewing from the lingual aspect.

641 - 2. From the embossed dot on the corner of the film. If you are looking into the depression, you are viewing the film from its lingual aspect.

641 - 3. Mental foramen; mandibular canal.

641 - 4. Nasal spine.

641 - 5. Maxillary sinus; maxillary tuberosity.

641 - 6. Mandibular canal; ramus of the mandible.

641 - 7. Maxillary sinus.

641 - 8. Maxillary incisors and cuspids appear larger than their mandibular counterparts; maxillary molars have three roots, whereas mandibular molars have only two; the shape and position of the teeth.

642 - 1. *Detail* refers to the sharpness of the image; *density* refers to the degree of blackening of the film; and *contrast* refers to the difference between the black, white, and various shades of gray on the film.

642 - 2. c.

642 - 3. g.

642 - 4. m.

642 - 5. i.

642 - 6. b.

642 - 7. k.

642 - 8. f.

642 - 9. l.

642 - 10. a.

642 - 11. j.

642 - 12. h.

642 - 13. d.

642 - 14. e.

CHAPTER 3

643 - 1. It promotes a feeling of harmony that makes the job more enjoyable and results in a smoother running, more reputable dental service.

643 - 2. By fulfilling the psychological needs of your patients and coworkers.

643 - 3. Even harmless horseplay can have a negative effect on a patient who is in pain or who is apprehensive.

643 - 4. The spirit of the Golden Rule.

643 - 5. You should have checked items b, c, e, and h.

644 - 1. First you must make preparations for the patient, next you greet the patient, and finally you seat him in the dental chair.

644 - 2. An alcohol sponge.

644 - 3. The basic diagnostic group should be placed on the bracket table. Other instruments should be neatly arranged with as few visible as possible.

644 - 4. If the record is complete and current, if it is the correct record, and if positive responses on the dental patient health history are indicated on the outside of the folder.

644 - 5. Before the patient is seated or in a way that will not cause the patient undue alarm.

644 - 6. Walk to the waiting room and greet the patient pleasantly by his name and rank.

644 - 7. At the door of the treatment room.

644 - 8. Noncontroversial subjects like the weather or the patient's hobbies.

644 - 9. It should be placed in its lowest position and the bracket table and engine arm should be swung out of the way. If the chair has an adjustable backrest and headrest, they should be positioned for the average patient.

644 - 10. The occlusal plane of the patient's mandibular teeth.

644 - 11. Maintain light conversation with the patient, but be extremely careful not to commit the dental officer to a treatment plan he cannot fulfill.

645 - 1. The routine and the surgical drape.

645 - 2. To protect the patient's clothing.

645 - 3. The towel chain.

645 - 4. The paper side should be placed toward the outside. This allows spilled liquids to be absorbed rather than running down the plastic onto the patient's clothing.

645 - 5. When the cavitron is being used.

645 - 6. When contamination is the prime consideration.

645 - 7. It prevents the patient from seeing instruments, prevents the light from shining in his eyes, and prevents the accidental contamination of the instruments by the patient's hair.

645 - 8. Have the patient lift his head from the headrest, lay two sterile towels across the headrest, and have the patient lay his head back on the towels. Crisscross the top towel across the eyes and secure it with a towel clamp. Allow the bottom towel to drape naturally around the patient's neck and shoulders. Cover the patient's chest with a drape and secure it at the back of the neck to the bottom head drape with a pair of towel clamp forceps.

646 - 1. You must know the instruments the procedure requires and the ones the dentist prefers.

646 - 2. You can lay them on the bracket table or place them in setup trays or packs.
646 - 3. In their sequence of use.
646 - 4. In oral surgery.
646 - 5. Packs need less storage space, but trays allow you to place the instruments in their sequence of use.
646 - 6. It is a corrosion-resistant and autoclavable tray in which instruments and supplies are placed. The contents are usually covered with a towel, cloth, surgical wrapper, or suitable metal lid.
646 - 7. After sterilization is completed, write the date that the contents will no longer be considered sterile on the autoclave tape.

647 - 1. To render the operating site insensitive to pain.
647 - 2. c.
647 - 3. l.
647 - 4. b.
647 - 5. f.
647 - 6. a.
647 - 7. d.
647 - 8. e.
647 - 9. g.
647 - 10. k.
647 - 11. m.
647 - 12. j.
647 - 13. h.
647 - 14. i.

648 - 1. The routine of the procedures and the related instruments and the materials required.
648 - 2. A spoken word, a slight to moderate movement of his hand, or only a pause in using the instrument.
648 - 3. It should be pointed toward the treatment area.
648 - 4. Knowing when to mix.
648 - 5. To have the needed item at the right place, in the right position, and at the right time.

649 - 1. To give the dentist easier operating accessibility, to allow a better view of the operation site, and to protect the tissues being retracted.
649 - 2. The Thoma #1 and #2 are helpful for retracting gingival flaps, and the Seldin #23 and Molt #9 may be used on gingival flaps and other tissues. The mouth mirror is effective for retracting the tongue, cheeks, and lips.
649 - 3. Pressure firm enough to prevent slippage, but not firm enough to cause unnecessary tissue bruises and trauma.

650 - 1. To maintain a clean field of operation.
650 - 2. Water from the unit's spray system or water syringe.
650 - 3. Normal saline and sterile water.
650 - 4. e.
650 - 5. b.
650 - 6. d.
650 - 7. a.
650 - 8. c.

651 - 1. An attempt to gather microorganisms from a patient and to promote the growth of those microorganisms.
651 - 2. Endodontic samples are obtained by placing and then removing a sterile paper point into the pulp canal. Samples from surgical sites are obtained by swabbing the site with a sterile cotton-tipped applicator.
651 - 3. You should flame the tube.
651 - 4. The penase ascites.
651 - 5. Patient's name, date of the sample, whether it is the first, second, etc., culture taken, description of the sample, and type of report desired.
651 - 6. Whether it is positive or negative.
651 - 7. 37° C. or 98.6° F.
651 - 8. Within 48 hours.
651 - 9. Ascites solution appears cloudy and gelatin exhibits a moldlike growth.

652 - 1. First, you should remove all debris from the patient's face. You may do this yourself or provide the patient with a dampened towel and mirror and let him clean his face. Next, remove the patient's drape and position the chair, operating light, and bracket table so that the patient can easily exit the chair. Return any personal belongings to the patient and arrange for any needed future appointments.
652 - 2. Usually this can be done during breaks in the chairside assisting routine. If this isn't possible, you should complete the paperwork right after the patient departs rather than detaining him.
652 - 3. All medications and materials must be put back into proper order. Instruments must be scrubbed and sterilized. The equipment should be cleaned and disinfected.
652 - 4. Obtain any additional supplies or equipment that will be needed for the next patient.

653 - 1. Inventory, ordering, turning in, and storing.
653 - 2. To be sure that you don't run out of supplies during a patient's treatment and that you don't have an excess of materials on hand.
653 - 3. Daily.
653 - 4. Hoarding may deprive other personnel of the supplies they need; it invites thievery, ties up supply dollars needlessly, and may result in loss due to deterioration.
653 - 5. Failure to turn in excess supplies has the same adverse effect as hoarding.
653 - 6. Taking the steps necessary to protect the supply items.

654 - 1. T.
654 - 2. F. They should both be seated.
654 - 3. F. It should be positioned for the convenience of both the operator and the technician.
654 - 4. T.
654 - 5. T.

655 - 1. a, d.
655 - 2. b, c, e.
655 - 3. a, b, c, d.
655 - 4. b.
655 - 5. a, c.
655 - 6. a, b.
655 - 7. b.

656 - 1. The dentist should be in the 8- to 11-o'clock position and the assistant in the 2- to 5-o'clock position.
656 - 2. The transfer zone.
656 - 3. To the level where the dentist's elbow is as close as possible to the field of operation.
656 - 4. 14 to 16 inches.
656 - 5. 4 to 6 inches above the dentist's eyes.
656 - 6. Toward the head of the chair and so that you have easy access to the needed instruments and materials.

657 - 1. To increase production while reducing stress and fatigue to the operator and assistant.
657 - 2. Because of the absence of the cuspidor.
657 - 3. The time lost when the patient expectorates.
657 - 4. So that it adequately evacuates saliva, debris, and water from the oral cavity and yet does not interfere with the dentist's view or access to the operating site.

657 - 5. Since your right hand is busy aspirating, you must learn to pass instruments with your left hand.
657 - 6. By placing the first cutting bur the dentist needs in one high-speed handpiece and the second bur he needs in the other high-speed handpiece.
657 - 7. The treatment routine.

658 - 1. It can indicate bleeding tendencies or allergies, which could alter the original treatment plan and therefore prevent an emergency.
658 - 2. You might detect that he is becoming apprehensive and be able to reduce his apprehension through casual conversation, thereby preventing syncope.

659 - 1. You should make sure it is available, conveniently located, and functioning properly.
659 - 2. That it is supplied with the proper levels and that the supplies are in good condition and have not passed their expiration date.
659 - 3. The phone number of medical personnel needed for assistance in any emergency arising in the dental clinic.
659 - 4. Lower the back of the chair so that his head is hyperextended.
659 - 5. Grasp the mandible and elevate the chin, then check for and remove any obstructions.
659 - 6. Pinch the nostrils closed.
659 - 7. 14 to 18 times per minute for adults and 20 times per minute for children.
659 - 8. Place the heel of one hand on the patient's lower sternum, then place the other hand over the first. Use your body weight to rapidly force the lower sternum downward from $1\frac{1}{2}$ to 2 inches. Hold for $\frac{1}{2}$ second then release rapidly. Repeat this procedure every second.
659 - 9. A hard surface.
659 - 10. When blockage of the airway cannot be removed and the patient will die without this treatment.
659 - 11. Place a blanket roll or other object under the patient's shoulders to hyperextend his head.
659 - 12. It is the almond-shaped depression just below the Adam's apple.
659 - 13. So that you don't penetrate the esophagus.
659 - 14. One that will not collapse.

660 - 1. Because oxygen supports combustion and even a small spark could trigger an explosion.
660 - 2. T.
660 - 3. T.
660 - 4. F.
660 - 5. F.
660 - 6. T.
660 - 7. F.
660 - 8. T.
660 - 9. F.
660 - 10. F.
660 - 11. T.
660 - 12. F.
660 - 13. T.

661 - 1. f.
661 - 2. h.
661 - 3. g.
661 - 4. c.
661 - 5. b.
661 - 6. a.
661 - 7. d.
661 - 8. e.
661 - 9. Your role is basically supportive. You should inspect the kit daily to be sure it is adequate and to correct any deficiencies. If the kit is needed, you assist the dentist by preparing and aiding with the administration of the drugs.

662 - 1. e.
662 - 2. e.
662 - 3. g.
662 - 4. d.
662 - 5. c.
662 - 6. a.
662 - 7. a.
662 - 8. g.
662 - 9. f.
662 - 10. b.
662 - 11. d.
662 - 12. f.
662 - 13. b.
662 - 14. c.

CHAPTER 4

663 - 1. Schedules annual examinations of military members, examination and routing of sick call patients, treatment planning, and special examination in support of the medical mission.
663 - 2. The annual dental examination.
663 - 3. The patient's dental problem is diagnosed and he is routed to the appropriate section for treatment.
663 - 4. To provide a systematic approach to clinical dental care.
663 - 5. The foldout located in the back of AFM 162-1, *Administration of USAF Dental Activities.*
663 - 6. The completion of forms.
663 - 7. Because it is the first professional treatment area of the dental clinic to which the patient is exposed.

664 - 1. To restore decayed or fractured teeth to their original functional ability and esthetic quality.
664 - 2. Maintain light conversation with the patient, check his dental records, and place the radiographs and treatment records so that they will be convenient to the dental officer.
664 - 3. Wash and dry your hands in full view of the patient, lay out the required instruments, attach the saliva ejector, and turn on and adjust the dental operating light as the dentist approaches the patient.
664 - 4. In case a second injection is required.
664 - 5. By retracting the cheeks or tongue and irrigating and aspirating as required.
664 - 6. When the dental officer is carving and finishing the restoration.
664 - 7. Wash and sterilize them along with the instruments that were used.

665 - 1. e.
665 - 2. h.
665 - 3. b.
665 - 4. g.
665 - 5. a.
665 - 6. d.
665 - 7. f.
665 - 8. c.

666 - 1. Self-confidence has a calming effect on a nervous patient.
666 - 2. To prevent cross-contamination.
666 - 3. You should previously discuss the essentials for each type of operation with the oral surgeon.
666 - 4. The view of the treatment area.
666 - 5. You should place them in a quiet area of the clinic and make sure they are not left alone.
666 - 6. Have him loosen restricting clothing and remove and properly store any prosthetic appliances.
666 - 7. Scrubbing with a handbrush and soap.
666 - 8. After.

666 - 9 Most surgical procedures require two or more injections and supplying two syringes will allow you to supply the syringes to the dentist with minimum time loss.
666 - 10. Because his gloves reduce tactile feeling, thereby increasing the possibility of his dropping the instrument.
666 - 11. Because the oral surgeon must be able to see what he is doing and the accumulation of blood and saliva in the rear of the patient's mouth have a tendency to excite the patient's gag reflex.
666 - 12. A container of sterile distilled water or saline solution and an irrigating syringe.
666 - 13. A gauze sponge that has been moistened with irrigating solution.
666 - 14. Quietly point it out to the oral surgeon.
666 - 15. Clean the patient's face and remove or cover the blood stained instruments and aspirator bottle.
666 - 16. To make sure that he is steady on his feet and shows no signs of distress.

667 - 1. The pulp is dead.
667 - 2. To remove the contents of the pulp canal, clear up infection, and insert a root canal filling material.
667 - 3. Because the infection must be completely cleared up before the pulp canal is filled.
667 - 4. A barbed broach.
667 - 5. Rubber dam.
667 - 6. Root-canal reamers and files.
667 - 7. A paper point.
667 - 8. To ensure that the growth of microorganisms has ceased.
667 - 9. When you obtain a negative culture.
667 - 10. Gutta percha or a silver point sealed with root canal cement.
667 - 11. The exact approach your dentist takes toward root canal therapy.
667 - 12. Apicoectomy.
667 - 13. It is removed.
667 - 14. By incising the soft tissue and removing overlaying bone with a bur or chisel.
667 - 15. Curettes.
667 - 16. The surgical assisting procedures.

668 - 1. F.
668 - 2. T.
668 - 3. T.
668 - 4. F.
668 - 5. T.
668 - 6. F.
668 - 7. T.
668 - 8. T.
668 - 9. b.
668 - 10. e.
668 - 11. d.
668 - 12. a.
668 - 13. c.
668 - 14. Oral surgery.

669 - 1. Type I.
669 - 2. To diagnose conditions that must be corrected before he starts prosthodontic treatment.
669 - 3. To determine irregularities of the occlusion that require correction or that are a factor in determining the type of appliance to be constructed.
669 - 4. The procedures to be accomplished during the appointment and the laboratory time required between appointments.
669 - 5. By closely coordinating the patient scheduling with the dental officer and the dental laboratory.

670 - 1. A full denture is an appliance that replaces the full number of teeth in the arch. The appliance is fabricated from acrylic with porcelain or acrylic teeth.
670 - 2. The preliminary impressions are taken and the AF 519 is initiated.
670 - 3. Soften the compound, place it in the tray, after the tray is positioned in the mouth, cool it with water until the compound hardens.
670 - 4. To prevent materials from sticking to his skin.
670 - 5. The second appointment is used to take the final impression.
670 - 6. One of the "wash" types.
670 - 7. The baseplates and occlusal rims are constructed.
670 - 8. This appointment is used to record interocclusal relationship and to select the artificial teeth.
670 - 9. The casts are mounted on an articulator, the teeth are setup into the wax occlusal rim, and the wax is trimmed so that it resembles a denture.
670 - 10. To try the waxed-up denture in the patient's mouth and make whatever adjustments are necessary.
670 - 11. To insert the denture.

671 - 1. A removable partial denture is an appliance replacing less than the full number of teeth in one arch. These appliances may be constructed from gold, chrome-cobalt, or acrylic, with porcelain or acrylic teeth.
671 - 2. The rest of the preparations are cut into the abutment teeth and the impressions are taken.
671 - 3. A rimlock tray.
671 - 4. To prevent distortion caused when the impression material dries out.
671 - 5. Occlusal rims are constructed and the master casts are sent to the ADL to have the metal framework constructed.
671 - 6. The occlusal and centric relationships are recorded and the tooth shade and mold are selected.
671 - 7. Inserting the appliance.

672 - 1. c.
672 - 2. g.
672 - 3. a.
672 - 4. f.
672 - 5. j.
672 - 6. i.
672 - 7. d.
672 - 8. h.
672 - 9. e.
672 - 10. b.
672 - 11. The tooth is prepared, then the dental officer constructs a wax pattern of the crown or inlay in the mouth. The wax pattern is then sent to the laboratory for investing or casting.
672 - 12. The tooth is prepared and an impression is taken. The impression is then sent to the dental laboratory.
672 - 13. The impression is poured to make a die and a wax pattern is constructed on the die.
672 - 14. The wax pattern is placed in a casting ring and invested in heat-resisting gypsum. The casting ring is heated in an oven to eliminate the wax. Molten metal is then cast into the void left from the wax, thereby forming the crown or inlay.
672 - 15. The crown or inlay is cemented into place.
672 - 16. They replace all or part of the coronal tooth structures.

673 - 1. It is an appliance permanently fixed to abutments with inlays or crowns which cannot be removed by the patient. It is usually fabricated from gold and has porcelain or acrylic facings.
673 - 2. A pontic is an artificial tooth suspended from one or more abutments of a fixed partial denture.
673 - 3. A cantilever bridge.

673 - 4. An impression is taken of the entire arch with the castings in place. The impression is poured up in a special soldering investment. The pontic is then stabilized in its proper position with soldering investment and attached to the castings with gold solder.

674 - 1. F.
674 - 2. T.
674 - 3. F.
674 - 4. T.
674 - 5. T.
674 - 6. F.

675 - 1. Those that require impressions and those that do not.
675 - 2. The replacement of a posterior tooth.
675 - 3. The shrinkage and changes which the tissues that support the dentures undergo.
675 - 4. The original denture.
675 - 5. In the dental laboratory.

676 - 1. Most impressions tend to distort because of dehydration or room temperature variations.
676 - 2. Plaster of paris, hydrocal, or minor variations of these.
676 - 3. T.
676 - 4. T.
676 - 5. F.
676 - 6. F.
676 - 7. T.
676 - 8. F.
676 - 9. The two-step method.
676 - 10. The boxed method.
676 - 11. The upright method.
676 - 12. Wet paper, asbestos, wax, or any other suitable material.
676 - 13. The vibrator.

677 - 1. The model trimmer.
677 - 2. $^1/_8$- to $^1/_4$-inch.
677 - 3. To the outermost edge of the peripheral roll.
677 - 4. One way is to follow the contour completely around the peripheral boundary. The other way is to trim the outer border in four straight lines. These lines run from the third molar area to the cuspid and from the cuspid to the midline on either side of the cast. The posterior border should be trimmed so that the highest point does not exceed the occlusal plane level.

678 - 1. They are used usually on patients needing full dentures to take the final (detailed) impressions.
678 - 2. Self-curing acrylic resin.
678 - 3. The dough and the sprinkle method. In both methods the cast is first coated with a separating material. Using the dough method you mix the acrylic powder and liquid until it reaches the dough stage, mold it with your hands into a wafer, and adapt it to the cast. Use some of the material to form a handle. Using the sprinkle method you sprinkle powder over the cast, saturate it with liquid, and repeat this procedure until you reach the desired thickness.
678 - 4. Failure to blockout undercuts will result in a damaged cast or tray when you attempt to remove the hardened tray.
678 - 5. By filling them in with baseplate wax or modeling clay.
678 - 6. By adapting a sheet of baseplate wax over the cast before you adapt the acrylic.
678 - 7. Perforation can help minimize tissue displacement and provide retention of the impression material to the tray.

679 - 1. Biting relationships refer to the patient's vertical biting depth, occlusal plane, midline, contour and fullness of the lips and cheeks, etc.
679 - 2. A baseplate and bite rim.
679 - 3. The slurry water acts as a separating media.
679 - 4. Center the baseplate on the cast; then use an alcohol torch or Bunsen burner to soften the baseplate. Using your fingers you then adapt the material to the cast. Trim off the excess material and smooth any rough edges.
679 - 5. Paper clips.
679 - 6. Soak the cast in slurry water. Dip the cast into melted baseplate wax and quickly readapt the baseplate to the cast.
679 - 7. Baseplate wax.
679 - 8. More baseplate wax.
679 - 9. Heat and roll a sheet of baseplate wax into a cylinder shape. Shape it like a horseshoe, adapt it to the baseplate and shape with a compound knife and wax spatula.

☆U.S. GOVERNMENT PRINTING OFFICE:1975-640-059/334
AUGAFB, ALA (751503) Feb 75-3000